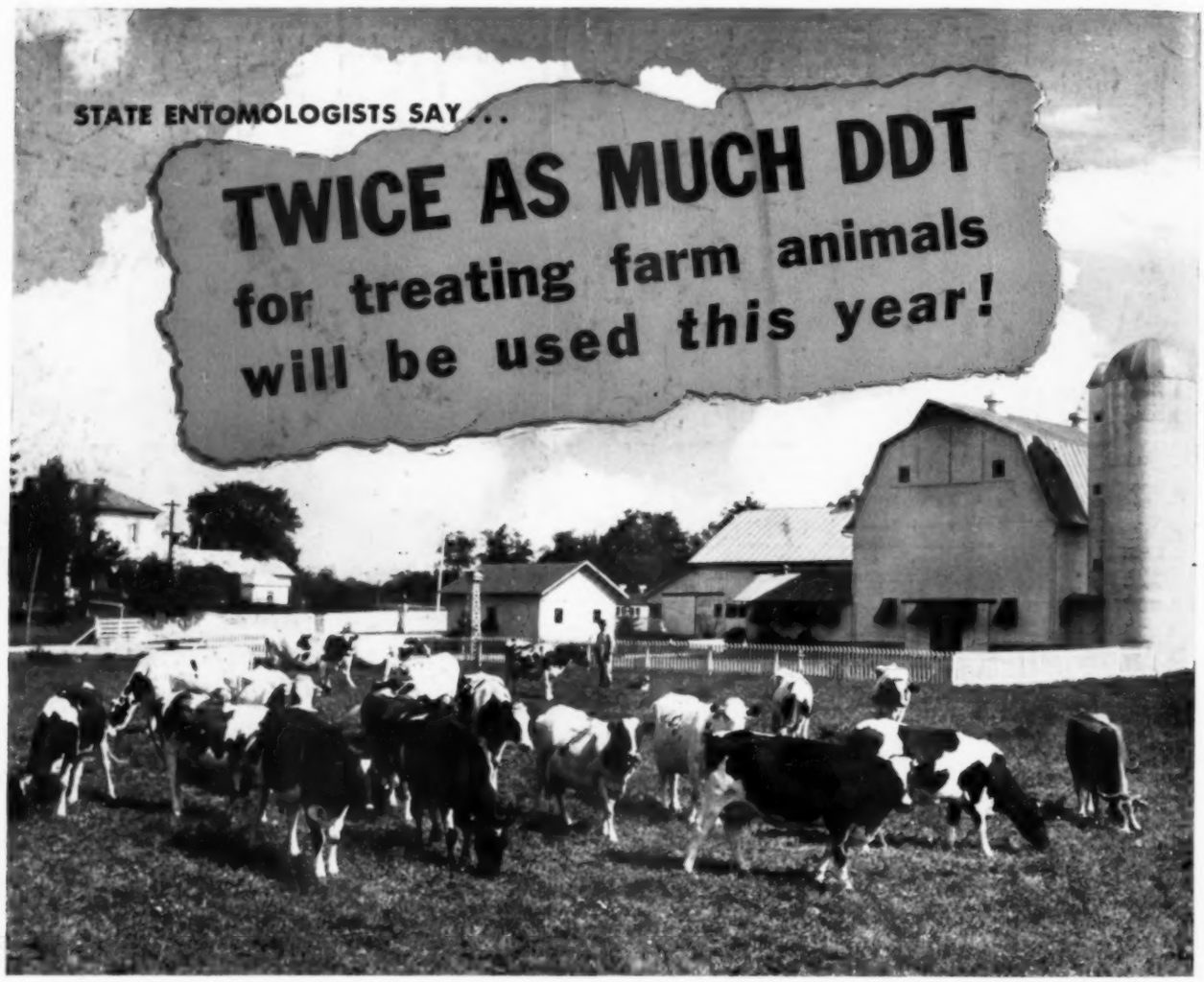
AGRICULTURAL CHEMICALS

AGRICULTURAL INSECTICIDES • FUNGICIDES • STOCK DIPS AND SPRAYS
FUMIGANTS • DAIRY FARM CHEMICALS • WEED CONTROL CHEMICALS • FERTILIZERS
SOIL TREATING MATERIALS • SEED TREATING CHEMICALS • RODENTICIDES

Volume II June, 1947 Number 6



Baker's DDT

CONTROLS MANY LIVESTOCK INSECTS

More and more farmers are treating their livestock and barns with DDT to control stable flies, horn flies, house flies, and lice.

A recent survey by a national farm magazine—covering 11 midwestern livestock states—showed that the state entomologists in all 11 states are recommending and are actively engaged in programs promoting the use of DDT for farm animals.

The entomologists estimated farmers in their states treated 4,591,410 animals with DDT in 1946. They estimated 9,743,375 animals will be treated in 1947—*more than double the number treated last year!*

Many of the entomologists also indicated they were recommending the use of DDT for the control of certain fruit and potato insects—the codling moth, Japanese beetle, and Colorado potato beetle.

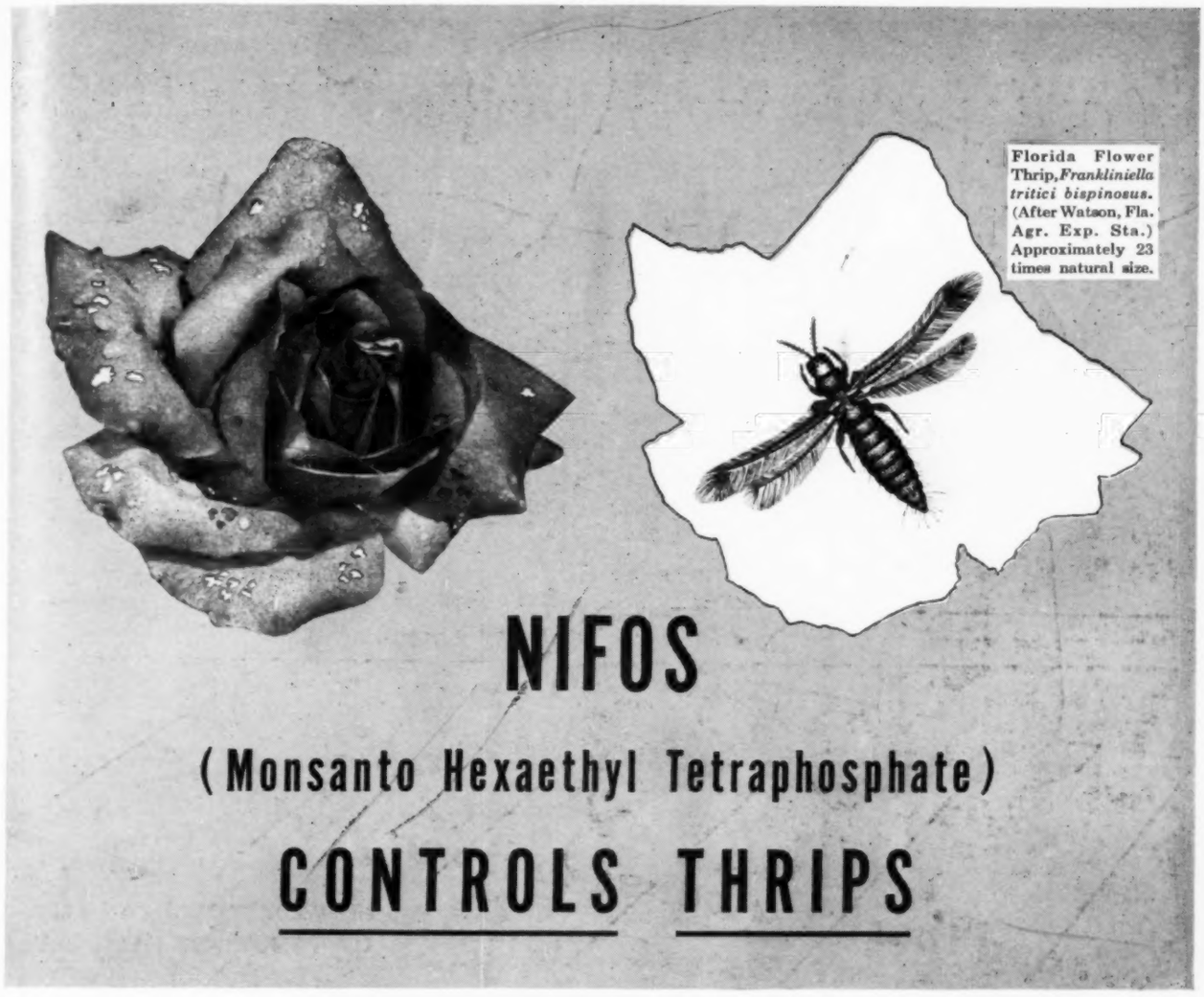
To those who formulate insecticides, this survey indicates an increasing market for DDT! The J. T. Baker Chemical Co., although unable to provide all the DDT you may want, is increasing its facilities for your future requirements.

Baker's DDT is a granular product approaching a white color, with a minimum setting point of 89° C. It is uniform in color, makes a clear solution, and is free flowing and uniform in particle size. This enables the manufacturer to perfect his mix before grinding.

Baker's DDT is available in 25, 50, 100 and 200-lb. containers. We invite you to write us for prices and tell us your requirements. Address *Organic Chemical Division,* J. T. Baker Chemical Co., Phillipsburg, N. J.

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL



Florida Flower Thrip, *Frankliniella tritici bispinosus.* (After Watson, Fla. Agr. Exp. Sta.) Approximately 23 times natural size.

NIFOS

(Monsanto Hexaethyl Tetraphosphate)

CONTROLS THRIPS

In addition to controlling many agricultural pests, Nifos* — Monsanto's Hexaethyl Tetraphosphate — has also been found effective against flower thrips.

Formulation is simple. Spray solutions may be made by adding Hexaethyl Tetraphosphate directly to water and including wetting and spreading agents to assist in wetting the insect. Or, emulsions may be made by dissolving Hexaethyl Tetraphosphate in a suitable solvent, such as xylene, and incorporating an emulsifying agent. This may then be added to water in the desired concentrations.

Sold only for the manufacture of economic poisons.

New data are constantly being accumulated on the effectiveness of Nifos. For further information write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 S. Second St., St. Louis 4, Mo.

COMPATIBILITY

Based on present information, and according to data published in the "American Fruit Grower," February, 1947, Hexaethyl Tetraphosphate is compatible with the following common agricultural chemicals:

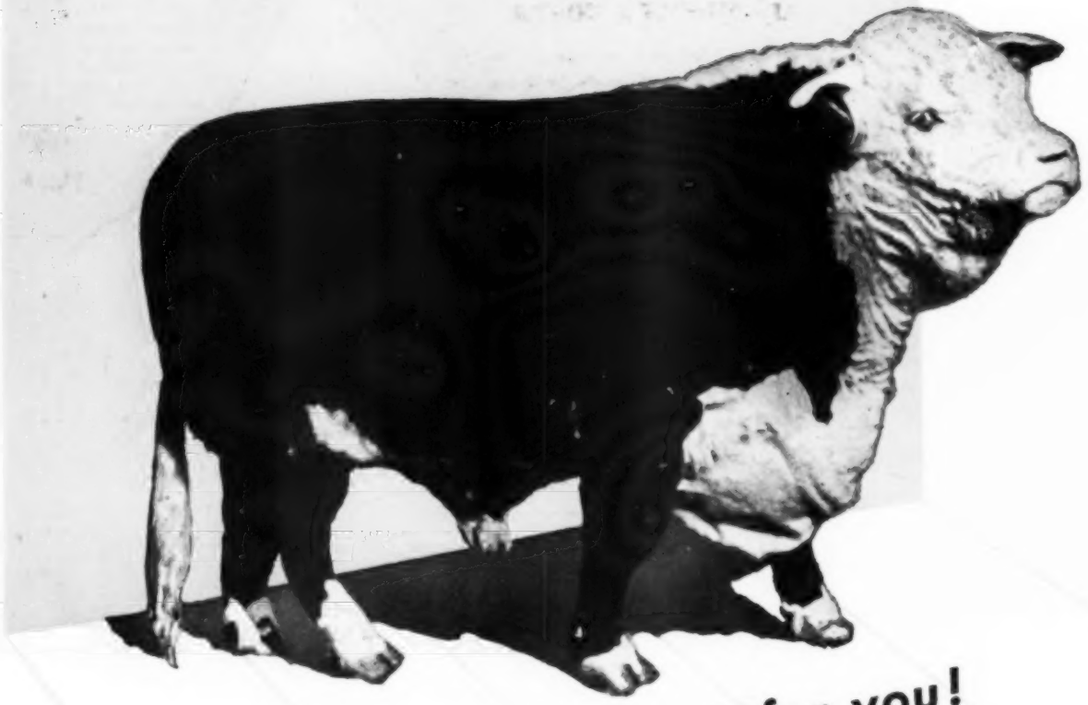
Chlordane	("Velsicol 1068") ("Octa-Klor")
DDT	Summer oils
Dormant oils	Sulfur
Hexachlorocyclohexane	

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

TODAY, HE'S 50 LBS. "MEATIER"



. . . and there's a bonus in it for you!

Yes, it's a proved fact—beef cattle add extra weight when properly protected with DDT from annoying insect pests . . . up to 50 pounds per animal per season that provide a bonus in extra profits for cattlemen.

There's a bonus in it for you, too . . . if you recommend a *dependable* cattle spray for this purpose. There are differences in insecticides—differences in quality, formulation, price, effectiveness. You can offer a superior, proved, widely accepted product if you handle Penco Cattle Spray. This spray is specially designed to cut the natural oils of animals' hair, giving a more thorough wetting without excessive runoff, and results in longer lasting residual effect. It's a 50% DDT wettable powder that controls horn flies, lice, certain other cattle pests.

HERE'S WHY YOU CAN RELY ON PENCO CATTLE SPRAY

1. Produced "from the ground up" by Pennsalt—a leading basic producer of agricultural chemicals.
2. Thoroughly tested in the field and at Experiment Stations.
3. Micron-sized for easy, stable suspension and deposit.
4. Made with superior spreaders and stickers for more thorough wetting and residual action.
5. Equally effective for spraying cattle or barns, or as a livestock dip.

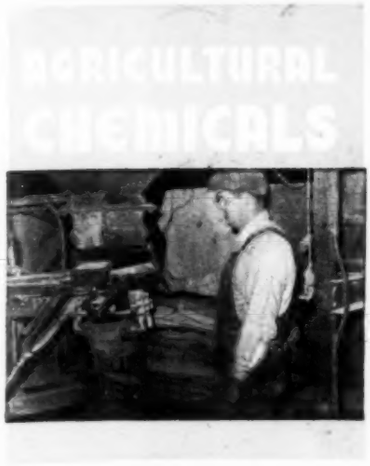
Write us for further details about Penco Cattle Spray and other famous Penco products.

Penco WB-50 spray base
Penco DB-50 dust base
Penco Cattle Spray
Penco DDT Technical
Penco Emulsion Concentrate
Penco Solvent Concentrate
Kryocide natural cryolite
Penite 6 (Sodium Arsenite) Weed Killer
Penite Concentrate 40 Weed Killer
Penco 2,4-D Weed Killer
Penco Basic Copper Sulphate

Penco Gamex W-10 (Benzene Hexachloride) 10% Gamma Isomer spray base
Penco Gamex D-10 10% Gamma Isomer dust base

PENCO
AGRICULTURAL CHEMICALS

Agricultural Chemicals Division
PENNSYLVANIA SALT MANUFACTURING COMPANY
PHILADELPHIA 7, PA.
TACOMA, WASH. BRYAN, TEXAS



THIS MONTH'S COVER

Bagging fertilizer is one of the important steps on the route between production and consumption of the material. This photo taken at plant of M. Karp & Sons, Farmingdale, L. I., New York.

JUNE, 1947
VOL. II No. 6

In This Issue:

Editorials 15
Guest Editorial 16
By W. J. O'Neill
Manganese, Fertilizer Element 17
By J. F. Wischhusen
Colloidal DDT 21
By G. S. Kido and T. C. Allen
Fungicidal Adhesive 24
By S. L. Hopperstead
2,4-D Control of Aquatic Weeds 27
By Samuel Mims
Insecticide Labeling Problems 29
By Allen B. Lemmon
Chemical Defoliation of Cotton 33
By P. W. Gull & E. W. Dunnam
2,4-D in Sod Areas 37
By Paul Marth
Blight Warning Service 41
Comments 43
By Dr. Alvin J. Cox
N.F.A. Committee Visits Florida 45
California Insecticide Needs 47
By Stewart Lockwood
Listening Post 51
By Paul R. Miller and G. J. Haeussler
Raw Materials Market 53
Suppliers' Bulletins 55
Technical Briefs 57
Industry News 61
Industry Patents, Trade Marks 72
Classified Advertising 73
Advertisers' Index 73
Tale Ends 74

A Monthly Magazine For the Trade

IRA P. MACNAIR
Editor

WAYNE E. DORLAND
Associate Editor

LAWRENCE A. LONG
Managing Editor

THOMAS MORGAN
Advertising Manager

Editorial Advisory Board ...

DR. ALVIN J. COX
Palo Alto, Calif.

LEA S. HITCHNER
New York

DR. S. E. A. MCCALLAN
Yonkers, N. Y.

DR. CHARLES E. PALM
Ithaca, N. Y.

S. A. ROHWER
Washington, D. C.

DR. COLIN W. WHITTAKER
Washington, D. C.

AGRICULTURAL CHEMICALS

Subscription Rates: *One year* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00.

Published monthly on the 15th by Industry Publications, Inc. Office of Publication, 123 Market Place, Baltimore 2, Md. Advertising and editorial office, 254 W. 31st St., New York, 1, N. Y. Advertising rates made known on application. Closing date for copy—25th of the month previous to date of issue.

Entered as Second Class Matter at the Post Office at Baltimore, Md., under the Act of March 3rd, 1879.

This INSECTICIDE made from ORBISCIDE CONCENTRATES really does KILL!

Yes, all insecticides made with Orbiscide Concentrates really do kill because that's the way they are designed. The finest research, the finest raw materials and the finest conditions of control all go into the production of Orbiscide Concentrates. That is why they are guaranteed to satisfy.

There's an Orbiscide Concentrate for every insecticide need. If you have a specific problem involving the use of such products, why not let our research department work it out for you? There's no obligation on your part and we do produce results. Orbis knows insecticides!

Investigate these current offerings today.

ROTENONE ORBISCIDE CONCENTRATES

Cube Resins—with definite rotenone content.
Cube Powder—4 - 5% Rotenone.
5% Rotenone Oil Concentrate.

DDT ORBISCIDE CONCENTRATES

25% DDT Emulsifiable Concentrate.
30% DDT Oil Concentrate.
DDT plus Rotenone Emulsifiable Concentrate.
50% DDT Wettable Powder Concentrate.
50% DDT Superfine Powder Concentrate.

Write, wire or phone for complete information and samples. Let us solve your insecticide problems. No obligation.

INSECTICIDE SALES DIVISON

ORBIS PRODUCTS CORPORATION
215 PEARL STREET, NEW YORK
FACTORY AND LABORATORY: NEWARK, N. J.

COSMETIC RAW MATERIAL
WATER SOLUBLE GUMS
FOOD COLORS

PERFUME BASES
ESSENTIAL OILS
FRUIT FLAVORS

QUINCE SEED
OLEO RESINS
STEARIC ACID

WAXES
THYMOL
AROMATICS

CHICAGO PHILADELPHIA MEXICO, D.F BOSTON LOS ANGELES MEMPHIS, TENN.

DDT PRODUCTS

POWCO BRAND
REG. U.S. PAT. OFF.

Available in Quantity

Yes, Powell has DDT products—quantities of them—ready for immediate delivery. These DDT Concentrates—made of technical grade DDT, minimum set point 89° C, are ready for further reprocessing by insecticide manufacturers who want the best.

There's no worry about quality when you specify Powco Brand. It is this symbol of quality that enables insecticide manufacturers to put out their own distinctive products—the finest obtainable.

Investigate these Powco Brand DDT Concentrates today:

TECHNICAL GRADE DDT — Minimum set point 89°C.

JP25—Liquid, water miscible DDT spray concentrate with 25% by weight of technical grade DDT plus solvent.

JP50—Micron sized DDT dust concentrate with 50% by weight of technical grade DDT.

JP50W—DDT wettable powder concentrate of extremely fine particle size with 50% by weight of DDT technical.

GET THESE JP25 BOOKLETS!

JOHN POWELL & CO., INC.

BASIC MATERIALS FOR
INSECTICIDE MANUFACTURERS

ONE PARK AVE, NEW YORK 16, N.Y.

JP 50W

JP50

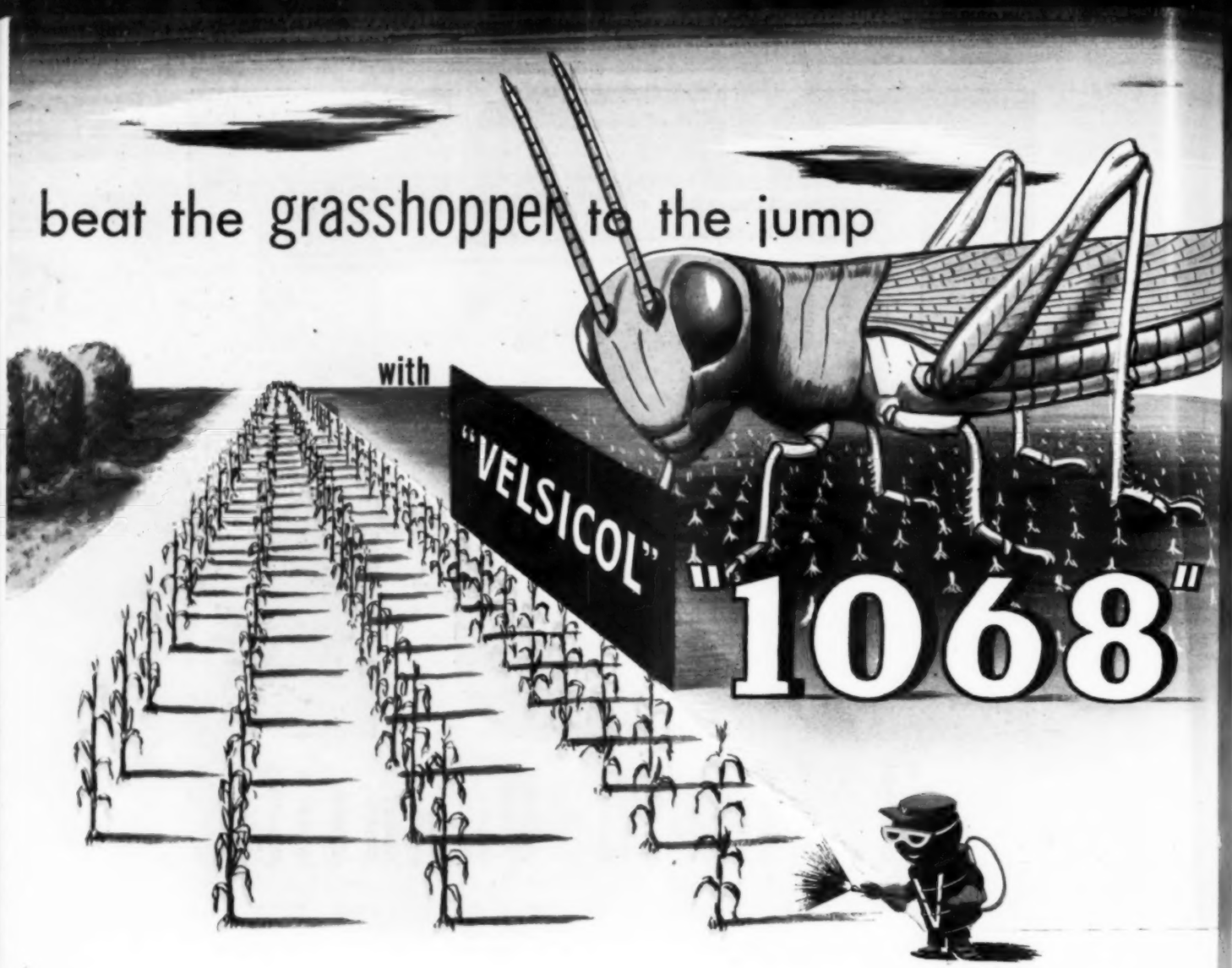
Please send me your booklet on
☐ JP25 ☐ JP 50 ☐ JP50W

Send full information and prices on .....

Name .....

Company .....

Address .....



The grasshopper—voracious and insatiable—has been feared since prehistoric times as an unconquerable pest causing incalculable damage. Fields invaded by a grasshopper horde were destined for total ruin and destruction.

NOW, COMPETENT CONTROL AND CROP PROTECTION ARE POSSIBLE WITH THE USE OF "VELSICOL" "1068" INSECT TOXICANT.

Formulated as either a dust or as a water emulsion, "Velsicol" "1068" will provide a high initial grasshopper kill plus an effective residual insecticidal toxicity for treated areas.

Write today for Velsicol Agricultural Technical Information Bulletin No. 205

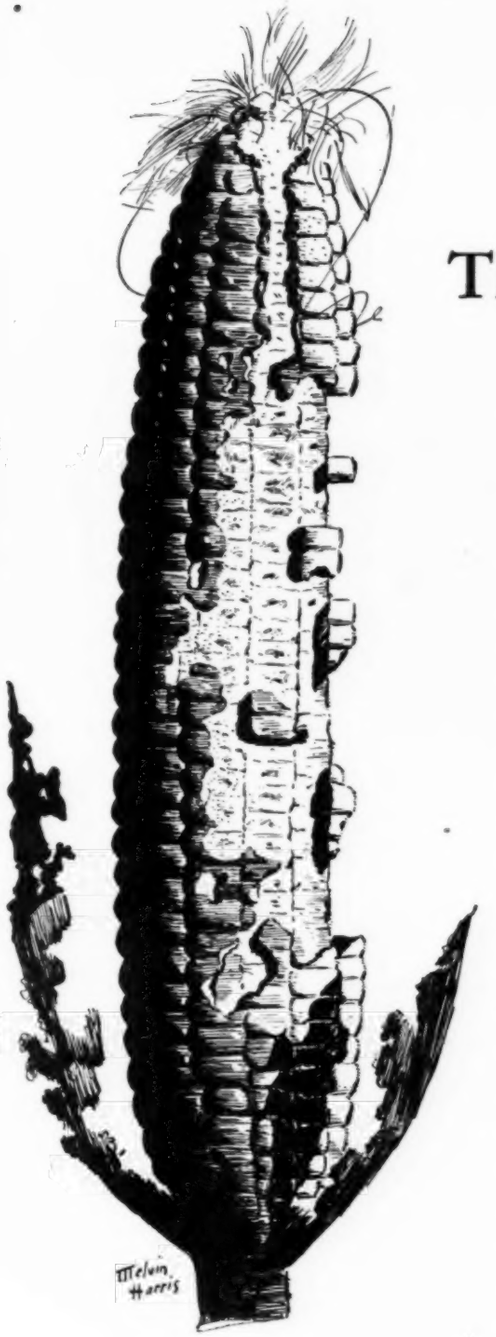
VELSICOL Corporation

Manufacturers of: Insect Toxicants • Aromatic Solvents • Coresin Core Oils • Synthetic Resins

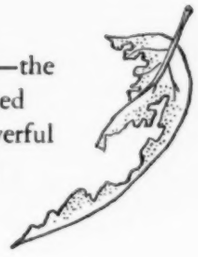
General Offices: 330 East Grand Avenue, Chicago 11, Illinois

Branch Offices: New York • Detroit • Cleveland

Representatives: E. B. Taylor Co., Los Angeles 13 • E. M. Walls, San Francisco 11 • J. E. Russell, Houston 11
Geo. Missbach & Co., Atlanta 3 • Midwest Products, St. Paul 4 • Natural Products, Montreal, Canada



The condemned ate a hearty breakfast



The news is good from the food front—the news that many an insect pest has ruined its last important food crop. For a powerful and versatile new insecticide—benzene hexachloride—has been developed to aid the entomologist's war against famine and disease.

Here are a few facts about the properties of benzene hexachloride:

One of the most versatile insecticides known, it acts as a stomach poison, contact poison, and fumigant.

It is deadly to many insects previously difficult to control —weevils, wireworms, cockroaches, Japanese beetles, ants, flies, mosquitoes, and fleas.

It is less toxic to warmblooded animals than many other insecticides. Harmless when dusted on the skin, it is ideal for use in delousing powders.

It can be mixed easily in dry or liquid form for use as a powder or spray.

It evaporates gradually, leaving no dangerous residues on food crops at harvest time.

CSC pioneered the investigation and development of benzene hexachloride in the United States. A new Commercial Solvents plant—one of the first in the country built for the purpose—now devotes its entire output to the mass production of CSC Benzene Hexachloride.

CSC

BENZENE HEXACHLORIDE

$C_6H_6Cl_6$

COMMERCIAL SOLVENTS CORPORATION, 17 EAST 42ND STREET, NEW YORK 17, N. Y.

Another Big Year Ahead for

2-4-D WEED KILLER

Yes, indeed! The season for the much discussed and widely used 2-4-D Weed Killer will soon be here. You can capitalize on this highly profitable ready-made market by offering your customers the proven product of Baird & McGuire.

Easy and safe to handle, harmless to ordinary grasses, yet deadly to a long list of noxious weeds and plants. Baird & McGuire 2-4-D is completely water soluble . . . no separation nor sedimentation . . . it forms clear solutions in water.

Furthermore, it will pay you handsomely to get our low prices before you buy.

Available Under Private Brands in These Sizes:

8 OZ. • 16 OZ.
QUART • GALLON
Also in Bulk • 55 Gal. Drums

10% 20% 30% 40%
CONCENTRATIONS

Write for Prices and Full Details *Today!*

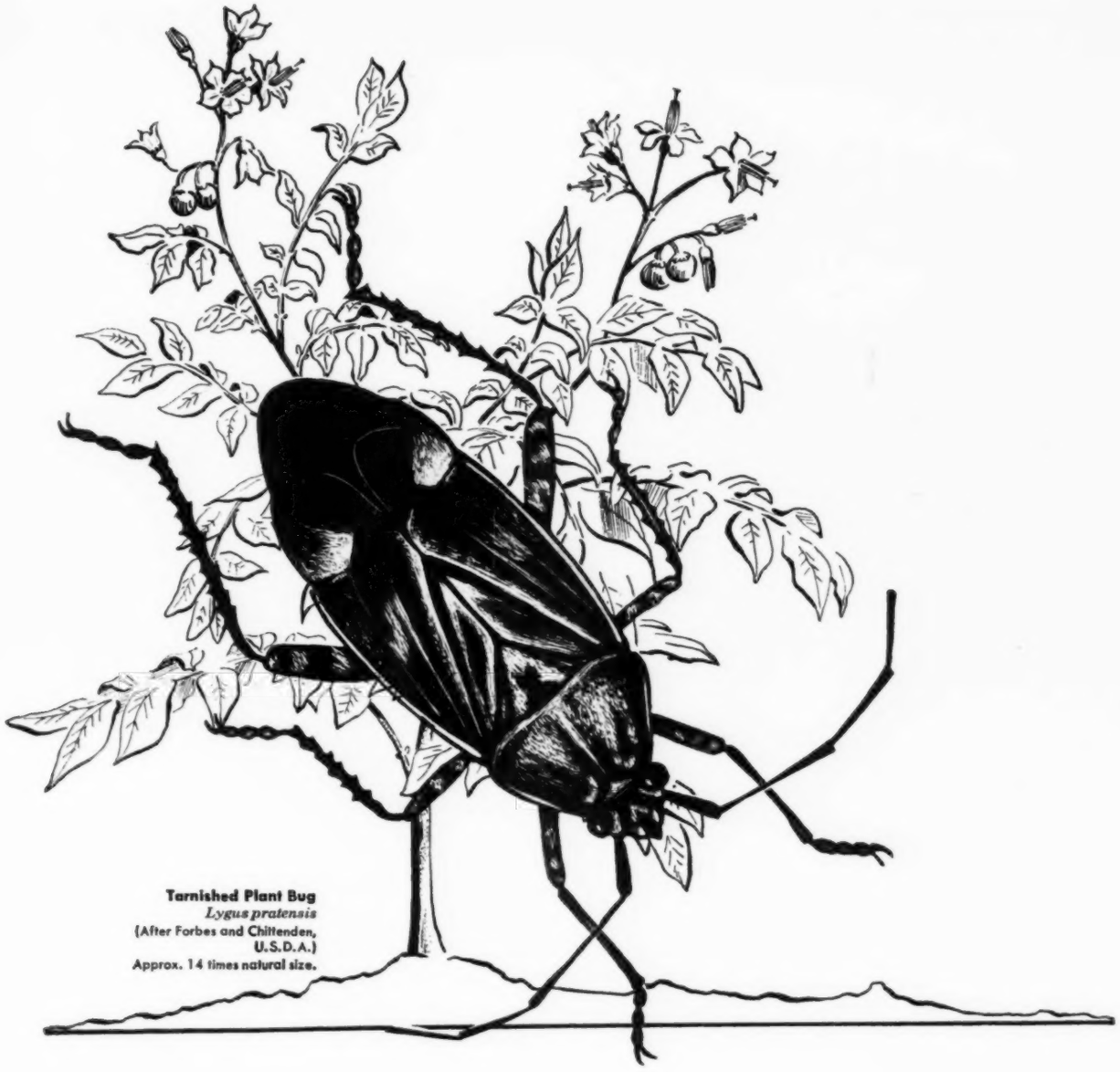
AGRICULTURAL DIVISION

Baird & McGuire, Inc.

ST. LOUIS, MO. • HOLBROOK, MASS.

Baird's

DISTRIBUTORS AND JOBBERS ONLY



Tarnished Plant Bug
Lygus pratensis
(After Forbes and Chittenden, U.S.D.A.)
Approx. 14 times natural size.

SANTOBANE (MONSANTO'S DDT)

The tarnished plant bug is another of the many pests successfully controlled with proper formulations containing Santobane* — Monsanto's DDT. It is preferred by many manufacturers of insecticides because it is a uniform, free-flowing, granular material that can be easily solubilized, emulsified or milled.

Santobane is an established Monsanto product — capacity for its production is being increased to meet growing demands.

Inquiries concerning Santobane, its properties and uses will receive prompt attention. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second St., St. Louis 4, Mo. **Reg. U. S. Pat. Off.*

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Cyanamid

CHEMICAL AIDS TO AGRICULTURE

AERO† Cyanamid, Granular — Free-flowing, strongly alkaline, long lasting form of nitrogen. For direct application . . . formulating complete fertilizers . . . weed and disease control.

AERO† Cyanamid, Pulverized, Mixers' Grade — Supplies nitrogen, neutralizes excess acidity and improves mechanical condition of fertilizer mixtures.

AERO DEFOLIANT† Chemical Dust—To hasten crop maturity and facilitate harvesting. Also for selective weed control.

AEROPRILLS‡ Ammonium Nitrate Fertilizer—33.5% nitrogen. Contains both nitrate and ammoniacal forms.

AERO-PHOS‡ Florida Natural Phosphate —33% Total P_2O_5 . . . for soil building purposes.

High Grade Florida Phosphate Rock—70% to 77% B.P.L. ... for superphosphate manufacture.

CYANOGAS† Calcium Cyanide—The positive insecticide and rodenticide in dust, granule and flake form.

AERO‡ BRAND HCN DISCOIDS — Hydrocyanic acid gas absorbed in thin cellulose discs. For thorough pest control in enclosed spaces.

BARWEED† 2,4-D Weedkiller — Liquid, powder or dust in various concentrations.

BARSPROUT‡ Sprout Inhibitor—Prevents sprouting of potatoes and other root crops in storage.

ACRYLON† Spot Fumigant — For direct application to food-processing machinery. Harmless to food and equipment.

LIQUID HCN—Ideal for enclosed space fumigation of mills, warehouses, etc. Harmless to food and equipment.

CLINGSPRAY† — Pre-harvest fruit drop inhibitor in liquid concentrate and dust form.

ACCOTOX‡ 50% DDT Wettable Powder —Micron-sized for sustained effectiveness.

ACCOTOX 50% DDT Dust Concentrate— Micron-sized for better dilute dusts.

PHENATOX‡ Chlorinated Camphene — Dust or wettable powder. Effective against cotton insects and many other pests.

GAMMALOID‡ Benzene Hexachloride Wettable Powder—Effective as a spray, dip or dust against many insect pests.

VATSOL† OS Wetting Agent—Invaluable for insecticide and fungicide dusts.

VATSOL† K Wetting Agent — For wettable powder insecticides.

SULFUR, Wettable and Dusting Grades.

BARBAK† C-1 Seed Corn Disinfectant— Guards against seed and soil-borne diseases.

Write for full descriptive literature

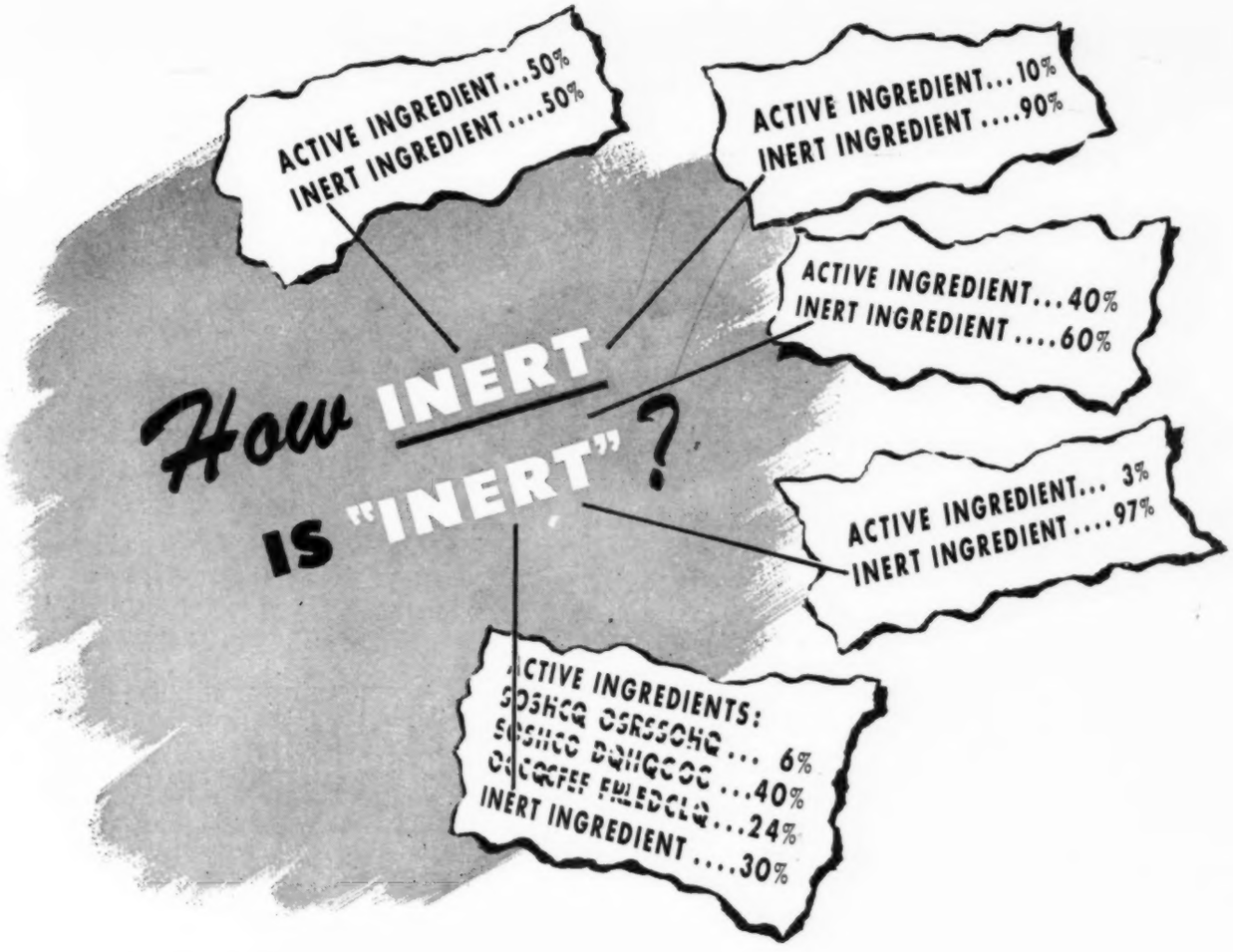
AMERICAN CYANAMID COMPANY

Agricultural Chemicals Division

32-M Rockefeller Plaza New York 20, New York

Branch Offices: 628 Dwight Building, Kansas City 6, Mo. • 2203 First Avenue, South, Seattle 4, Wash. Azusa, Calif. • Brewster, Fla. • 1207 Donaghey Building, Little Rock, Ark. 235 Montgomery Street, San Francisco 4, Calif.

† Reg. U. S. Pat. Off. ‡ Trade-mark



Of "inert", Mr. Webster says: "Incapable of producing an effect." Obviously he wasn't thinking of dust concentrate or finished dust formulas in which Attaclay is the "inert" ingredient. People who investigate, make or use dusts are becoming more and more aware of the vital part the *right* carrier and diluent can play. And for many in the trade—in more and more formulas—Attaclay is capably producing the good effects most wanted.

Right now we make no claim that Attaclay alone is biologically active. But, in many cases, Attaclay has a favorable effect on the activity of the toxicant. And certainly it eases steps in the making and putting on of dusts. So, let's compose our own carrier and diluent glossary:

ADSORPTIVITY—Uniformly accepts up to 90% of chlordane—50% DDT or benzene hexachloride—2-5% additive oils, yet retains its dry, lump-free state. This means greater killing power per pound of finished product.

FLOWABILITY—Attaclay's freedom from caking and lumping insures trouble-free flow through processing and dusting equipment. This means less down-time for maker and user.

HARDNESS—Does not induce abnormal wear on mixing machines or dusting rigs. This means cheaper maintenance.

DUSTABILITY—Excellent characteristics as regards dispersion, even coverage, tenacity. This means cheaper pest control.

WETTABILITY—Attaclay has inherent wetting action on "hard-to-wet" toxicants. This means formulation savings.

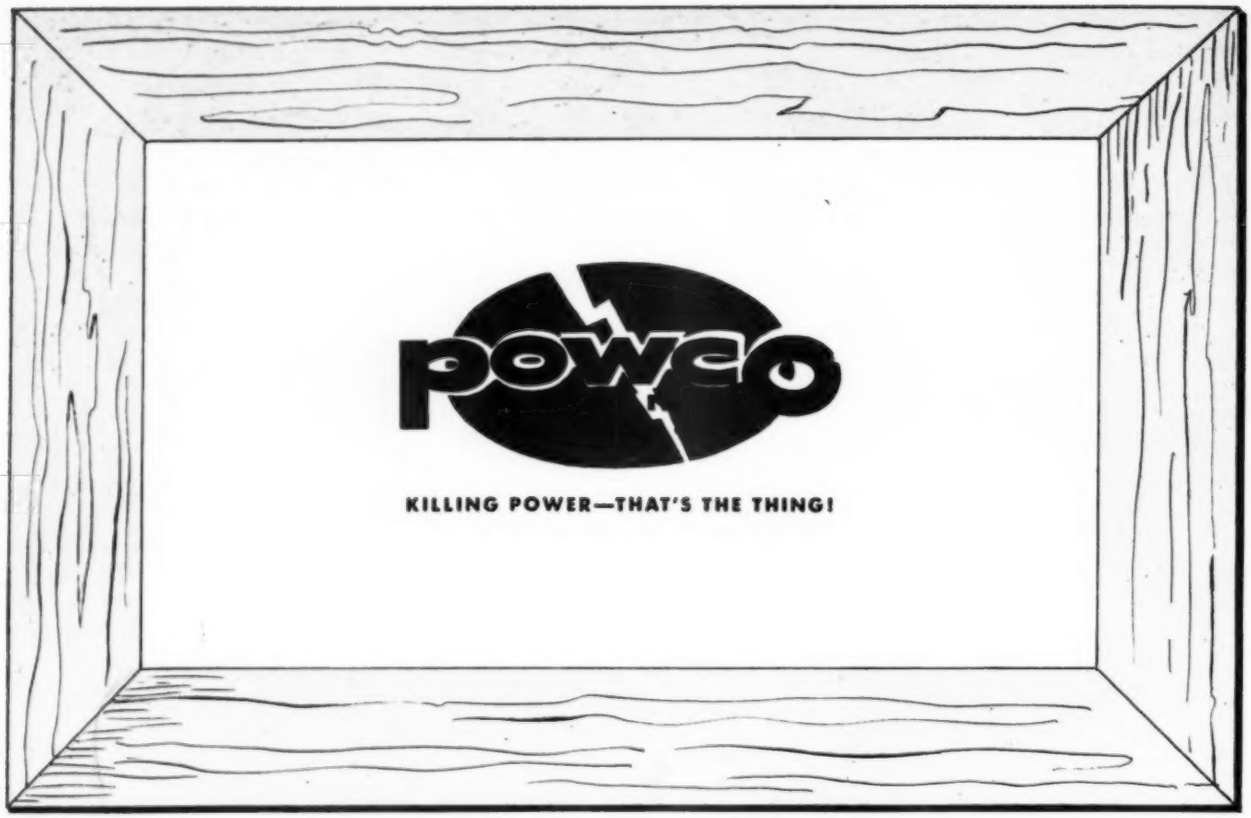
SUSPENDABILITY—Within the required range. Readily modified to meet specific formula needs. This means better performance.

COMPATIBILITY—Attaclay's high degree of chemical compatibility is well-established. This means flexibility—with safety.

These features all add up to one simple truth—it will pay *you* to test Attaclay. Write for a generous sample today.

ATTAPULGUS CLAY COMPANY

Dept. P, 260 South Broad Street • Philadelphia 1, Penna.



A Statement of Policy

For almost a quarter of a century
the Powell policy has been based upon quality.
Powell products are standardized biologically
and chemically for your protection.
Powell manufactures basic products for sale to
manufacturers only. Powell sells no consumer products.
Powco Brand is your guarantee that it's a quality product.

John Powell & Co., Inc.

BASIC MATERIALS FOR INSECTICIDE MANUFACTURERS

ONE PARK AVENUE, NEW YORK 16, N.Y.

THE EDITOR COMMENTS

AN aroused fertilizer industry is taking vigorous steps to defeat the new Soil Fertility Bill (S. 1251), now before the Senate Agricultural Committee. Representatives of both major fertilizer associations appeared before the committee in June to present testimony against the bill which the industry believes would undermine private enterprise.

According to the National Fertilizer Association, the bill would establish a national test-demonstration program on as many as two percent of U. S. farms, and would be financed, of course, by Federal appropriations. The bill would also provide for immediate construction by TVA, of a plant at Mobile, Ala., to produce phosphate fertilizers, and acquisition of Florida phosphate lands for a reserve. The Farm Credit Administration would lend cooperatives the money to finance the acquisition, construction and operation of plants to make fertilizers. Borrowers in turn would be required to set aside from their plant production an amount up to 50 percent, for use in the Government test-demonstration program.

From industry's viewpoint, S.1251 sets a dangerous precedent. While the program would be primarily for concentrated fertilizers, it might well be the entering wedge for Government production and distribution not only of *all* fertilizers, but also of insecticides, fungicides and other agricultural necessities.

In noting the provision for borrowers to set aside 50 percent of their output, one wonders what sane business man could favor an arrangement wherein half of his plant production is beyond his control, and subject to free distribution in competition with the other half of his own business.

We feel certain that neither well-operated farm cooperatives nor other industry plants want to lean on the government for support. They have demonstrated this in this past, and will continue to do so in the future. Our hope is that S. 1251 will receive a severe setback in the Senate.

THE Food and Agriculture Organization of the United Nations has a rather ambitious program under consideration designed to add to the world's available food supply by taking steps to eliminate all preventable loss of foodstuffs, either in the field, in storage or in shipment. Naturally agricultural insecticides, fungicides, rodenticides, etc., assume an important role in this program, and appropriate consideration will be given to these subjects at an International Conference to be held in London this summer.

If this program is to succeed—and the world need for food demands that it succeed—much will depend on the efficiency with which this international pest and disease control program is set up. And in enlisting the aid of American experts in the manufacture and use of control materials, we recommend particularly to the UN agency in charge that one of their first steps be to name a committee of industry to assist in planning and carrying out the program.

American manufacturers of insecticides, fungicides, application equipment, etc., American entomologists and pathologists, can and will contribute an important share to the success of such a program. But their contribution can be expected to be much more valuable to the program if they are consulted in advance, if they feel certain that the program is soundly conceived, if they are asked what, how much and when they can supply, if their advice is sought promptly on what to use and how to use it.

AS we go to press, the Andresen bill which would afford a new Federal statute to replace the antiquated Insecticide Act of 1910, has received favorable consideration by a Senate committee, and is on the floor for an early vote. Industry observers were expressing hope that the bill would be passed by unanimous consent, and not be thrown back for further consideration. The latter, in effect, would postpone its passage for a long time, since Congress is already facing a formidable array of other urgent bills.

Guest Editorial written especially for this issue of Agricultural Chemicals.

New Trends in Pest Control Seen in Washington Orchards

by W. J. O'Neill

Tree Fruit Branch Exp. Station
Wenatchee, Wash.

THE State of Washington produces about one-fourth of the commercial apple crop of the U. S. While this remarkable production is largely due to a particularly favorable climate for the production of fruit, such accomplishment is greatly aided through the use of large quantities of agricultural chemicals to combat insect pests and diseases.

Environmental factors are probably the reason for freedom from most serious disease problems on apples. The only problem in this field, apple powdery mildew, is somewhat of a minor nature and is of importance on not more than 15 percent of the commercial crop. Delicious and Winesap, which comprise 75 percent or more of the crop, are for practical considerations not affected by this fungous disease. For those susceptible varieties, such as Jonathan, Rome and other minor varieties, the annual application of a 2 percent lime sulfur solution at the pink bud stage has given satisfactory control.

Washington orchardists are now passing through a transition stage in their pest control practices. The widespread publicity and amazing effectiveness of DDT for codling moth control has encouraged growers to swing to new materials for the solution of their pest control problems. It is conservatively estimated that approximately 75 percent of the growers will use a DDT program for codling moth control in 1947.

If codling moth control alone is considered, there is no question as to the advantage of a DDT program. On the basis of three years intensive investigation of DDT for codling moth control, we have made the perhaps optimistic statement that a single annual application of DDT may be expected to control the codling moth once the population has been reduced to a minimum by a season or two of a more intensive program employing three or at most four sprays for the first year. The advantages are thus readily apparent if one compares the theoretical single spray of DDT with the re-

(*Turn to Page 71*)

MANGANESE...

Some practical aspects of its use as a fertilizer component

by

J. F. Wischhusen

Manganese Research & Development Foundation

THE Association of Official Agricultural Chemists (A.O.A.C.) has adopted the designation, "secondary fertilizer components," for a group of elements into which manganese is classed, but other scientific groups class it variously as a "rare," "trace," "minor," "essential," or "micro" element. Eventually, all may agree on a common designation. Not counting the primary and secondary chemical elements essential to agriculture such as nitrogen, phosphorus, potassium, calcium, iron, sulfur, etc., there are more than twenty-five minor or trace elements essential to plant life in one way or another. Of these trace elements, the more important include manganese, copper, boron, cobalt, zinc, silicon, aluminum, fluorine and iodine.

Soil can hardly be classified as fertile when deficient in available manganese, although manganese-deficient soils are not necessarily infertile for some crops. Most of the agricultural land in the U. S. has an ample supply of manganese, but some soils do need additional amounts. In cases where deficiencies occur, plant growth may be stunted and a total absence of manganese could bring about serious results as would characterize the total absence of nitrogen, phosphorus, or potash. The function of manganese is to act as a fertilizer and stimulant, to accelerate germination and maturation and to increase the yield and quality of crops. On the other hand, excessive amounts of manganese cause decreased growth and bring death to plant life, including fungi.

The importance of manganese in crop production was not generally recognized by the fertilizer industry until the memorable address of Oswald Schreiner (9) before the National Fertilizer Association at Colorado Springs in June, 1930. From that point on, the importance of manganese was far more widely appreciated by the industry, and its use as a plant food increased rapidly in areas where additional portions of the element were necessary.

Much has been published on manganese in agriculture over the past fifty years, but a brief review of some of the more recent developments may be of value in emphasizing to many processors and growers its recognized importance in the practical agriculture of many sections of the country. Gabriel Bertrand, (1) back in 1912 after some twenty years work, was perhaps the first to show that manganese occurs in all plants and that its function is mainly to act as a catalytic fertilizer. W. B. S. Bishop (2) a few years later in Australia, confirmed the fact that manganese is an activator,—increasing the rate of oxidation in plants and increasing the absorption of all elements, especially calcium. J. S. McHargue determined that manganese is not only essential to plant growth, but closely associated with the formation of vitamins, and together with iron, aids in the synthesis of chlorophyll. (3) (4)

These basically are the earlier views which in the past ten years have been augmented and confirmed by numerous reports on scientific findings. While manganese was first used as a component of plant food in Holland in 1909, its first important practical use was in Florida during World War I. It took fruit and vegetable growers there some time to appreciate its use in the light of dollars-and-cents profits. Today, its use has become regular practice among certain commercial growers operating on manganese-deficient soil. Many citrus growers in such areas, for example, regularly use fertilizers

While it is true that manganese is an important soil nutrient which needs to be built up in areas where it is deficient, most agricultural land in the U. S. seems to have ample quantities of the element. The soil of Florida and some other localities has been found wanting in manganese and other plant food, and in these cases efforts have been made to restore a balance. It should not be inferred from this article that manganese deficiency is a general situation throughout the United States. —The Editor.

which contain one to two percent of manganese calculated as the oxide.

Manganese Sulfate Sprays

ON quite a few crops manganese sulfate is used as a nutritional spray to correct a manganese deficiency in certain areas. This has proved particularly effective on spinach, potatoes, tomatoes, soybeans, beets, cherries, apples and plums, and also on some other vegetables and fruits where manganese is deficient. Nutritional sprays are common practice on citrus in California (5) and Florida (6). In a number of places, the observation has been made that manganese sulfate, when used in solution gave a better and quicker action than when used as a fertilizer. Nutritional sprays may prove the remedy, and we have experimental evidence that manganese sulfate 65%, at the rate of four pounds per one hundred gallons of water or other spray material, is effective when applied at ten day intervals during June and July, or whenever deficiency troubles first manifest themselves. The application of nutritional sprays will probably be limited to fruit and vegetable crops, but the fact that foliage in many cases responds to them is of great diagnostic value, showing the need of particular plants for manganese, and therefore also of the particular soils on which they are grown.

Another effective method of correcting a manganese deficiency on certain fruit trees, for instance apples, and in particular cherries (7), consists of drilling holes the size of a pencil into their trunks, and inserting manganese salts into the opening. This also has proved of great immediate benefit and of diagnostic value in barren orchards, enabling fertilizer practices to be adjusted to include manganese or whatever other elements may have been shown to be deficient.

During World War 1, much of the calcareous glade soils in Florida might have been abandoned as unproductive, had it not been for the discovery (8) that the manganese contained in manure was a limiting factor in the raising of tomatoes and other truck crops. Manganese sulfate was successfully substituted for manure where those conditions existed. Therefore, wherever sufficient manure is available for fertilizer purposes, an acute manganese deficiency may never be experienced. This is probably one of the reasons why in the older agricultural countries severe manganese deficiencies were not encountered earlier than in the U.S.A. Manganese additions to soils are unwittingly made in manure and other fertilizer raw materials, but as more concentrated and refined fertilizers are used, a manganese shortage may be induced in a manner that escapes detection.

Florida agriculture stands far in the lead of manganese applications, because of intensified crop production on calcareous, sandy, or muck soils, in which manganese is low to begin with, and subject either to fixation or leaching. In the fertilizer year 1943-4, Florida used 11,433 tons manganese sulfate 65% on citrus and vegetables (10). The amounts applied are relative to other commercial fertilizers used and recommendations vary between 1 and 2% manganese calculated as oxide. Other states too are translating experimental knowledge into action. In Michigan much work has been accomplished on manganese, copper, zinc, boron, etc., by Harmer (11) on muck soils, followed by Cook (12), and others on crops grown on mineral soils. As a result, fertilizer recommendations for 1946 in Michigan (13) include 20 lbs. manganese sulfate per acre on sugar beets wherever soil pH is above 6.9 and 100 lbs. for snap beans and radish. For home gardens on alkaline soils 2 to 3 lbs. manganese sulfate per 100 square feet are recommended, and from 5 to 15 lbs. per acre for various vegetables on muck soil of a pH 6.6 or higher.

Results in the Field

IN South Carolina, demonstrations under field conditions have recently taken place (14), in which some of the experimental work reported in the literature was put to a practical test. These demonstrations were made with crops of corn, tobacco, peanuts, sweet potato, alfalfa, lespedeza, oats, soybeans and pasture grasses. The chief materials used are seen in table below.

The conclusions drawn from this experiment are as follows:

1. Boron, magnesium, manganese, iron and zinc seemed to give better results than any of the other elements when used singly.
2. On the few demonstrations where a single element damaged the crop when used alone, the plots having this element in the total mineral mixtures gave excellent results.
3. The seed crop of nearly all plants used was greatly improved by the two mixtures, both in yield and quality.
4. The plant population on the two mixture plots on the pasture demonstrations was greater than on the check area.
5. Animals grazed heavily on the two pasture plots receiving the two mixtures.
6. Heavier applications of all elements except boron should be tried on all crops in future demonstrations.

Point 3 illustrates the effect of manganese on seed development, and attention should be drawn to a recent experiment (15) about seed

Elements Used and the Amounts of Each Element Applied

Element	*Material*	*Amount of Material Applied per Acre*
Magnesium	Magnesium Sulfate	40 lbs.
Manganese	Manganese Sulfate	40 lbs.
Cobalt	Cobalt Sulfate	5 lbs.
Zinc	Zinc Sulfate	30 lbs.
Boron	Borax	10 lbs.
Copper	Copper Sulfate	30 lbs.
Iron	Iron (ferrous) Sulfate	30 lbs.
Calcium	Limestone	1 ton
Sulfur	Flowers of Sulfur	20 lbs.
Nitrogen	(Products farmers had on hand)	16 lbs. N
Phosphorus	(18% Superphosphate)	600 lbs. per acre
Potassium	(50% muriate of potash)	100 lbs. per acre

germination, where it was found that manganese sulfate in a wide range of concentrations accelerated the rate of seed germination and growth, and that pretreatment of seed with the sulfate had also a favorable after effect.

Contemporary work shows applications of manganese and other micro nutrients to be of great economic value to pastures. In Florida (16), appreciable growth increases to grasses were obtained as a result of using from 20 to 75 pounds manganese sulfate per acre, together with copper, cobalt, iron, zinc, magnesium, boron, etc., when lime and complete N-P-K fertilizers were first applied. Sods were created within a few months which otherwise would have taken two years to develop (17). Manganese deficiency symptoms on grasses have also been identified in certain sections of Ireland by Walsh (18), in the form of chlorosis and "gray speck" quite similar to that on oats and wheat (19). Indications are that some grasses are very sensitive to a lack of manganese, and work on this subject is proceeding. Seeing that much livestock depends solely on pastures and hay during much of the year, this discovery is of considerable significance, and fully warrants regular manganese applications to pastures and meadows of from 25 to 50 pounds manganese sulfate per acre whenever they receive a dressing of complete fertilizers, lime and other inorganic nutrients.

Connor (20), has shown that certain cropped soils in Indiana contained only half the quantity of manganese in comparative virgin soils. Considerable work is in progress at present at Purdue on soybeans, cereal crops and corn. Preliminary reports indicate favorable responses to spray and fertilizer applications of manganese sulfate. Manganese deficiencies on soybeans appear widespread on the near neutral black sands and muck soils of North Central Indiana. Other midwestern states are about to become manganese conscious, and in Missouri considerable work by Albrecht (21) and Marshall (22) shows the assimilation of manganese by the plants to be a matter of soil pH. Sodium had a depressing effect on the availability of soil manganese. This work would go to explain complaints about poor crops from farmers in years when soils are limed. This may be nothing but a fixation of manganese, which thus automatically becomes a limiting factor. A supply of available manganese should be furnished the soil of crops when heavy liming has taken place, or when other bases are supplied to correct acid soils to a point of neutralization, or beyond.

Manganese Toxicity

A MANGANESE toxicity cannot be described with the same degree of clarity as a deficiency. This is largely due to its varied effects upon the assimilation by plants of other elements, and upon the bacterial activity in soils, which are largely matters of soil contents and soil reactions. A manganese toxicity may be merely a deficiency of other elements, notably calcium, magnesium, iron, phosphorus. A manganese status satisfactory to plant growth depends on a suitable balance between the relative rates of oxidation and reduction. The concentrations of soluble manganese toxic to plants, therefore, fluctuate with various conditions.

On the manganiferous soils of Hawaii (23), toxicity symptoms on pineapple have been prevented by the use of magnesium and phosphates, but not of lime. Those soils contain manganese from 2.43 to 9.74%, even up to as high as 15%, largely in the form of Mn_3O_4. By preventing the assimilation of magnesium, the excessive quantities of available manganese caused the destruction of chlorophyll, and a cessation of starch formation. Subsequent experiments (24), showed manganese to cause a depression of the assimilation of iron by the pineapple plants, which proved correctible with iron. Soils as well as ocean water, would quite generally be fatally contaminated if it were not for geochemical processes in which poisonous substances are precipitated. High manganese soils appear to be also of high alkalinity, where a pH of around 7 renders manganese nontoxic, but also non-available.

Sherman (25) showed that soils which contained less than 60 ppm of easily reducible manganese dioxide showed crop growth response to added manganese, whereas soils containing 302 ppm of easily reducible manganese dioxide showed no response. These variations then depict corresponding manganese tolerances by plants, and also explain some of the wide differences in experimental results. In Ohio, an apparent manganese toxicity on soybeans (26) corrected itself several weeks later, and a manganese deficiency is often mistaken for an iron toxicity, or vice versa. Destruction of crops due to waterlogging is often linked to high concentrations of manganese. The manganese in high organic soils becomes very soluble when submerged for only a short time. The drowning of plants, however, is not always a manganese toxicity.

That iron antidotes manganese toxicity is shown by Hopkins et al (27), and that a toxicity or deficiency of manganese, as well as iron, may lie in the iron-manganese ratio, rather than the total amount of soluble iron or manganese present in soil, as well as in plants, has also been shown by Somers and Shive (28). A ratio of 5 ppm manganese to 1 ppm iron showed no antagonistic action. Poor plant growth in acid soils is generally associated with the presence of toxic elements that can be antidoted with lime and other bases to correct the soil pH.

Recent greenhouse experiments by Fried and Peech (29) showed that lime as a crop nutrient on acid soils is superior to gypsum, and they attribute some of the poor growth of alfalfa on acid soils to excessive soluble manganese, which seemingly is correctible with lime (calcium carbonate), but not with gypsum (calcium sulfate).

Guide to Manganese Use

TO weigh all the evidence presented by research workers on manganese may easily prove discursive. But already some empirical criteriae have naturally built up, viz:

1. For all practical purposes:
   Toxicities are caused by high organic and moist soils, sulfur and acid

forming soil treatment of manganiferous soils.

Deficiencies are caused by leaching, soil erosion, crop removal, fixation of manganese in soils.

Benefits of applications consist of better growth, better quality crops, disease, frost and drought resistance, better seeds, better germination of seeds.

The overall effect of manganese deficiency is the production of substandard food and feed.

2. Manganese may be present in certain soils in insufficient quantities to warrant normal crop growth.

3. It may be present, but its availability may be reduced to such an extent that this element becomes a limiting factor for crop growth and quality, regardless of the quantity present. The beneficial action of manganese requires a soil pH of 5 and higher.

4. While manganese is necessary for optimum effect, some attention must be given to the quantity used. This depends on soil reactions.

5. The manganous-manganic equilibrium of soils is important.[25] In alkaline soil at least three parts per million of exchangeable manganese must be present for satisfactory crop production. In order to maintain an adequate level of the exchangeable fraction, this must be supplemented by at least 100 parts per million of easily reducible manganese. In acid soils, the optimum level of exchangeable manganese can be much lower, with the amount depending on the degree of acidity.

6. Field demonstrations and actual experience so far in manganese applications show 25 to 100 lbs. of manganese sulfate 65% per acre to be desirable additions to complete fertilizer, where a lack of manganese is noted. Manganese is most effective when other micro inorganic nutrients, N-P-K and lime are also used. All essential elements should be considered as a whole.

7. Application of manganese as a nutritional spray may prove a valuable and necessary adjunct to its use as a fertilizer: such practice can be recommended for fruits and vegetables wherever other spray materials are now used.

8. Excesses of manganese can easily be remedied by the use of lime or other bases. Calcium definitely counteracts the toxicity of high manganese concentrations.

Annual consumption in the U.S.A. of manganese sulfate 65% for all purposes stood at 8500 tons in 1941, but within the following year the demand literally tripled. The State of Florida, which had got along on 4,000 tons per annum during 1938-1941, actually used over 11,000 tons in 1942. This sudden increase in consumption was probably caused by two principal factors, and these were brought about by our entry into World War II. First, growers realized that manganese was a part of their operating cost, and as such a deductible item from taxable income; and secondly, the more extensive and greater use of manganese returned them bigger and better crops out of all proportion to the cost involved in areas where there had been a lack of manganese. This is probably true of the use of fertilizers generally, and of other so-called secondary fertilizer components as well; but it confirmed, perhaps better than anything else could have done, that the optimum use of manganese, as well as other fertilizer materials in agriculture is based on true economics.

References

(1) Bertrand. Gabriel. "The Use of Manganese as a Catalytic Fertilizer." Chemical Abstracts 6 (1912) #21—3150.

(2) Bishop, W. B. S. "The Distribution of Manganese in Plants and Its Importance in Plant Metabolism." Australian Jour. Exp. Biol. & Med. Sci. 5 (1928) #2. pp. 125-140.

(3) McHargue, J. S. "The Role of Manganese in Plants." Jour. Amer. Chem. Soc. 44 (1922), pp. 1592-98.

(4) McHargue, J. S. "The Role of Manganese in Agriculture." Soil Science, Vol. 60, #2, August 1945.

(5) Chapman, H. D., Brown, S. M. & Rayner, D. S. "Nutrient Deficiencies of Citrus." California Citrograph, May 1945.

Chapman, H. D., Liebig, Geo. F. Jr. & Parker, E. R. "Manganese Studies, California Soils and Citrus Leaf Symptoms of Deficiency." California Citrograph, Nov. 1939.

(6) Camp, A. F. & Fudge, B. R. "Some Symptoms of Citrus Malnutrition in Florida." Fla. Agr. Exp. Bulletin 335, 1939.

(7) Roach, W. A. "Soil Fertility and Trace Elements." Soil Conservation. Oct. 1945. East Malling Research St., Kent, England.

(8) Skinner, J. J. & Ruprecht, R. W. "The Influence of Manganese on the Agriculture of South Florida." Univ. of Florida. Agr. Exp. Sta. Bulletin #218. July 1930.

(9) Schreiner, Oswald. "Some New Factors in Fertilizer Practice." Address—Convention Natl. Fert. Assn. Colorado Springs, Colo.

(10) Kramer, L. H. "The Consumption of Manganese, Copper and Zinc Sulphates in Florida since 1940." Florida State Defense Council, Lake Wales, Florida.

(11) Harmer, Paul M. "War Time Productions of Vegetable Crops on Muck Soils." Michigan Extension Bulletin #244, Feb. 1943.

(12) Cook, R. L. & Miller, C. F. "Manganese for Oats and White Beans in Michigan." Proc. Soil Science Soc. of Amer. Vol. 6, 1941.

(13) "Fertilizer Recommendations for 1946." Michigan State College Ext. Bulletin #159, Feb. 1946.

(14) Peebles, C. S., Soils Specialist. "Demonstrations with Various South Carolina Crops 1945." Minor Plant Food Elements — Extension Service Field.

(15) Tsung-Le Loo & Yu-Wei Tang. "Manganese Sulphate, Indole B Acetic Acid and Colchidine in the Seed Germination and Early Growth of Several Cultivated Plants. Amer. Jour. of Botany 32: 106-114, Mar. 1945.

(16) Killinger, G. B., Blaser, R. E., Hodges, E. M. & Stokes, W. E. "Minor Elements Stimulate Pasture Plants." Bulletin #384, Univ. of Florida, Mar. 1943.

(17) Gratz, L. O., Florida Exp. Sta. "Trace Elements Serve Farmer." Florida Grower, Tampa, Fla. December 1945.

(18) Walsh, Thos. "Susceptibility of Grasses to Manganese Deficiency." Nature, 1945, Vol. 155, pp. 429-430.

(19) Gallagher, P. H. & Walsh, Thos. "The Influence of Manganese on the Growth of Cereals." Proc. Royal Irish Academy, Vol. XLIX, Sec. B, #11, Oct. 1943.

(20) Conner, S. D. "Factors Affecting Manganese Availability in Soils." Jour. Amer. Soc. of Agron.—Vol. 24, #9, Sept. 1932.

(21) Albrecht, William A. & Smith, N. C. "Calcium and Phosphorus as they Influence Manganese on Forage Crops." Bulletin Torrey Botanical Club. 68-372 (1941)

(22) Marshall, C. E. "The Exchangeable Bases of Two Missouri Soils in Relation to Composition of Four Pasture Species." Research Bulletin #385, Nov. 1944, Mo. Agr. Sta. pp. 34-35.

(23) Kelley, W. P. "The Functions of Manganese in Plant Growth." Hawaiian Sta. Bulletin 26 (1914) E. S. R. 129.

(24) Johnson, M. O. "Manganese Chlorosis of Pineapples: Its Cause and Control." Hawaiian Exp. Sta. Bulletin 52 (1924). E. S. R. 51, p. 851.

(25) Sherman, G. Donald & Harmer, Paul M. "The Manganous - Manganic Equilibrium of Soils." Proc. Soil Sci. Soc. 1942.

(26) Barnes, E. E., Dept. Agronomy, Ohio Agr. Exp. Sta. Wooster, Ohio. Private Communication.

(27) Hopkins, E. F., Pagan, V. & F. L. Ramirez Silva. "Iron and Manganese Ratio in Relation to Plant Growth and Its Importance in Porto Rico."

(28) Somers, I. I., Gilbert, S. B. & Shive, J. W. "The Iron Manganese Ratio in Relation to the Respiratory CO_2, and Deficiency - Toxicity Symptoms in Soybeans." Plant Physiology. 1942, 17: 317-320.

Somers, I. I., Gilbert, S. G. & Shive, J. W. "The Iron Manganese Relation in Plant Metabolism." Plant Physiology, 1942, 17: 582-602.

(29) Fried, Maurice, and Peech, Michael. "The Comparative Effects of Lime and Gypsum upon Plants Grown on Acid Soils." Jour. Amer. Soc. Agron. Vol. 38, #7, July 1946.

Colloidal DDT . . .

Its use in insecticide sprays

G. S. Kido* and T. C. Allen

University of Wisconsin, Madison, Wisconsin

TO obtain finely divided powders from Technical DDT by ordinary grinding methods is difficult because of the peculiar physical properties of the material. In general, there are three types of DDT spray formulations: wettable powder, emulsifiable oil, and solutions. Each product, however, appears to possess some undesirable features. The wettable powder usually consists of relatively large particles which without sufficient agitation, may settle rapidly in water. The addition of diluents to wettable powders may also be objectionable since such materials increase the bulk of the toxicant and do not contribute directly to toxicity. Emulsifiable oil preparations contain a solvent and the DDT remains in solution. Emulsifiable concentrates may be objectionable because of the presence of aromatic and unsaturated hydrocarbons or constituents of the solvent which are toxic to plants. The use of DDT-kerosene solutions is limited since the mixture may tend to injure plants if applied as a spray.

An effort, therefore, has been made to overcome some of the undesirable characteristics associated with the use of DDT as described in the above preparations. Liquid concentrates were prepared which consisted of finely divided DDT particles, most of which were approximately 1 micron in size but some of which were 30 microns long and 2 to 3 microns wide. In these preparations the DDT particles were suspended in water and flocculation was prevented by means of a dispersing agent. Such concentrates are designated as colloidal dispersions. Colloidal DDT suspensions have been described by Jones and Fluno[2] who have suggested the need of a more satisfactory formula.

Colloidal dispersion concentrates appear to offer a new approach in insecticidal formulations; and the physical properties of such material indicate that they may have some promise. Consequently, studies were undertaken to explore the various insecticidal possibilities of DDT colloidal dispersions.

Preparations and Properties

THE colloidal dispersions of DDT consist of two general types of formulation. One type contains DDT, an emulsifying agent and water. The other consists essentially of identical constituents except for the addition of a suitable DDT solvent. The latter proved to have more satisfactory physical properties and was adopted for evaluation of insecticidal performance. This colloidal DDT dispersion concentrate is composed of 40 percent DDT, 20 percent of a mixture of a saturated hydrocarbon petroleum distillate and alkylated aromatic hydrocarbons, 3 to 6 percent non-ionic emulsifying agent such as an aromatic hydrocarbon having one portion of the molecule a polyethylene oxide side chain, as for example a polyglycol ether alcohol, and 34 percent water. A typical formula consists of 40 percent DDT, 14 percent insecticidal base oil, 6 percent "PD544C," 6 percent "Triton X155M" and 34 percent water. The solvent used in the formulation may be entirely of alkylated aromatic hydrocarbons or such solvents as cyclohexanone or xylene. However, phytotoxicity tests with greenhouse plants have shown that plant injury is minimized by inclusions of small quantities of insecticidal base oils. The DDT in the above formulation was placed in a colloidal state in a colloid mill.[3]

The colloidal dispersion concentrate formed is of a creamy semi-solid consistency, pours readily, and does not cake. It is stable under ordinary storage conditions and retains its physical characteristics at temperatures as high as 70° C. Freezing or storage at 4° C. for 10 months solidifies the colloidal dispersion concentrate but does not alter its properties when thawed. When sprayed upon surfaces, deposits of DDT may be seen as fine, evenly distributed silvery particles. Little noticeable residue remains on plant surfaces, a fact favorable to the use of such preparations on ornamental plants grown in greenhouses. The settling rate of the diluted concentrate is slow compared to DDT wettable powders, so that very little agitation is required to keep the DDT in suspension. Since only a small quantity of oil is present in the dispersion, all the DDT exists in a solid phase and the material may not possess the tendency for toxic absorption exhibited by emulsifiable oils. Very little or no odor of oil is

1 Studies supported by an Industrial Research Grant by the Michigan Chemical Corp., Oct., 1945. *Industrial Fellow, Dept. Econ. Entomology, Univ. of Wisconsin.

2 Jones, H. A. and H. J. Fluno, 1946, DDT in colloidal-type suspensions. Jour. Econ. Ent. *39* (4) :536-37.

3 Special process developed by the Michigan Chemical Corporation, St. Louis, Mich.

evident in the concentrate or in the diluted material upon spraying.

Evaluation of Colloidal DDT

TESTS were conducted to determine the following points: (1) the relative insecticidal value of colloidal DDT spray residues as compared with various other spray deposits of DDT under laboratory conditions; (2) the phytotoxic properties of colloidal DDT dispersions and other DDT formulations under laboratory and field conditions; (3) the insecticidal value of colloidal DDT, emulsifiable DDT concentrate and DDT wettable powder under field conditions; and (4) the residual toxicity of colloidal DDT sprayed on limed surfaces for fly control.

Laboratory Residual Test

A RELATIVE residual toxicity test of various DDT formulations was conducted by spraying the materials in an aqueous mixture to Petri dishes (⅜" x 4") placed on a constant speed turntable revolving at the rate of three m.p.h. The sprays were applied at a constant air pressure of 37 lbs. Each test material was replicated four times. Houseflies were introduced in the dishes covered with glass plates when the spray deposits were dry, and then allowed to walk over the deposits. Approximately 20 to 30 flies were used per dish and the toxicity of the DDT deposit was determined by the time required to obtain a 50 percent knockdown. Materials tested were: (1) emulsifiable DDT concentrate containing ½ lb. DDT, 390 cc "Velsicol AR60," and 20 cc "Triton X155M;" (2) colloidal DDT with 40 percent DDT, 14 percent Sinclair insecticidal base oil, 6 percent "Velsicol AR50," 6 percent "Triton X155M" and 34 percent water; (3) micronized 50 percent DDT wettable powder; and (4) pulverized 50 percent DDT wettable powder.

The toxicity of colloidal DDT, emulsifiable DDT and micronized DDT wettable powder at the higher levels of concentration i.e., 1 and 2 lbs. of DDT per 100 gallons of water, appeared to be equally effective but at 0.25 lbs. per 100 gallons the effectiveness of colloidal DDT diminished and was lower than that of the emulsifiable DDT and micronized DDT. Pulverized DDT wettable powder gave the slowest knockdown rate under the conditions of the experiment. Results are presented in Fig. 1, page 23.

Phytotoxicity Tests

EXPERIMENTS were conducted to determine the relative susceptibility of plants to colloidal DDT dispersion. Since cucurbits are quite susceptible to DDT, they were selected as test plants. A variety known as "Straight Eight" was chosen. The plants were grown in the greenhouse and were potted in No. 2 tin cans containing a mixture of 1 part sand and 2 parts compost soil. Plants 13 to 20 days old placed on a constant speed turntable were treated with the sprays. Such plants were approximately 3 to 5 inches tall and consisted of two well developed cotyledons and two true leaves. Three plants were picked at random for each test of which there were three or four replications. Observations were made 48 hours after spraying, results of which are presented in Fig. 2.

Data from Fig. 2 indicate that the toxicity of colloidal DDT dispersions to cucumber plants is related directly to the amount of aromatic hydrocarbons present in the formulations. For example, colloidal mixture No. 1 which caused the most injury, contained 20 percent DDT, 20 percent "PD544C," 3.7 percent "Emulphor ELA" and 56.3 percent water or 1 part by weight of DDT to 1 part by weight of aromatic hydrocarbons. Colloidal mixture No. 2, on the other hand, caused moderate plant injury and contained 40 percent DDT, 14 percent Sinclair insecticidal base oil, 6 percent "PD544C," 4 percent "Triton X155," and 36 percent water or 4 parts of DDT to 2 parts of solvent of which approximately three-fourths was an insecticidal base oil and one-fourth aromatic hydrocarbons. Colloidal mixture No. 3 proved the least toxic, being formulated without the aid of any solvent.

TABLE 1.

Insect counts and potato yield from spray plots treated with various DDT formulations. Counts obtained by taking 16 sweeps per replicate 48 hrs. after treatment.

Treatments	Flea beetles Av. No.	Leafhoppers Av. No.	Yields bu./acre
1. Bordeaux & wettable DDT	35.0	649.5	288
2. Bordeaux & colloidal DDT	87.0	2443.0	281
3. Bordeaux & emulsion DDT	21.0	348.0	363
4. Tribasic & wettable DDT	48.5	597.0	327
5. Tribasic & colloidal DDT	73.5	942.5	306
6. Tribasic & emulsion DDT	19.5	186.5	366
7. Check, Bordeaux alone	174.0	4361.0	262

TABLE 2.

Residual value of various DDT formulations in combination with Bordeaux and tribasic copper sulfate. Sprays applied on June 13, and counts made on June 15 and 21.

No.	Materials tested	Insect counts per 16 sweeps June 15 LH*	June 15 FB	June 21 LH	June 21 FB	Increase/plot LH	Increase/plot FB
1.	Bordeaux & Wettable DDT	1.5	5.5	11.5	176.0	10.0	170.5
2.	Bordeaux & Colloidal DDT	1.0	6.0	18.0	423.0	17.0	417.0
3.	Bordeaux & Emulsion DDT	0	0	13.0	111.0	13.0	111.0
4.	Tribasic & Wettable DDT	5.0	1.5	13.5	286.0	8.5	244.5
5.	Tribasic & Colloidal DDT	0.5	2.5	24.5	622.0	24.0	619.5
6.	Tribasic & Emulsion DDT	0	0	9.0	87.0	9.0	87.0
7.	Check, Bordeaux alone	15.0	143.0	30.0	679.0	15.0	536.0

LH*—leaf hoppers FB —flea beetles

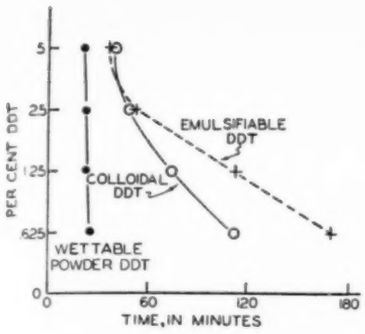


FIG. 1

Relative residual DDT toxicity of different formulations sprayed on Petri dishes as determined by the time required to give a 50% knockdown of flies. Each point represents an average of four replicates. The Technical DDT employed in the different formulations was obtained from the same source.

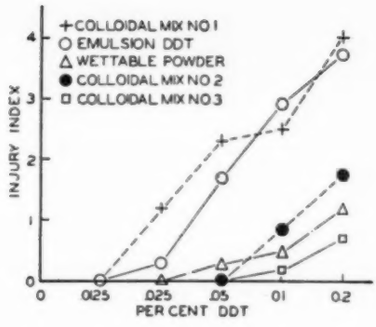


FIG. 2

Relative toxicity to cucumber plants of various DDT colloidal dispersions, DDT wettable powder and DDT emulsifiable concentrate. The injury index is as follows: 1 light, 2 moderate, 3 heavy, and 4 severe injury.

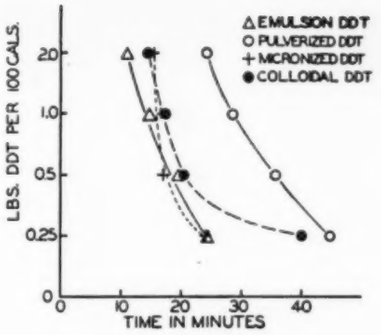


FIG. 3

Relative residual toxicity of various formulations sprayed on limed surface as determined by the time required to obtain a 50 percent knockdown of flies. Each point represents an average of four replicates.

This formulation however did not have entirely satisfactory physical properties and was abandoned for further testing. The phytotoxicity curve of the DDT emulsifiable concentrate was similar to that of colloidal mixture No. 1. The DDT emulsifiable concentrate was of the following composition: 12 percent DDT, 38 percent Velsicol "AR60," 20 percent vegetable oil, 20 percent "Duponol OV," 10 percent "Triton B1956."

Field Trials

SINCE colloidal mixture No. 2 proved relatively safe to use on greenhouse cucumbers, it was tested on this and other plants to determine its possible toxic effect under field conditions. Comparisons were made with a 50 percent micronized DDT wettable powder. Treatments as high as 8 lbs. of DDT per 100 gallons of water were applied to plants in various stages of growth. Results indicated that neither colloidal DDT nor the wettable powder were injurious to plant tissue when used at recommended dosages for insect control. Test plants included carrots, potatoes, peas, beans, lima beans, cucumbers, sweet corn and tomatoes.

Trials were also made to determine the insecticidal efficiency of colloidal DDT compared with other types of DDT formulations under field conditions. A potato field was selected since this afforded the opportunity to test insecticides in combination with fungicides. Field tests conducted in 1945 by Chapman and Allen[4] showed that DDT in combination with Bordeaux mixture gave less effective insect control and poorer potato yields than DDT in combination with other fungicides. This decrease in efficiency of DDT when mixed with Bordeaux may be caused by a physical masking by Bordeaux which reduces the insecticidal value of DDT. Field tests were designed to explore this possibility by substituting an insoluble copper fungicide for the bordeaux and also by using various types of DDT preparations with Bordeaux. The plots were treated as follows:

Plot 1.
10-10-100 Bordeaux
50 percent pulverized DDT wettable powder

Plot 2.
10-10-100 Bordeaux
Colloidal DDT dispersion containing 40 percent DDT
14 percent Sinclair insecticidal base oil
6 percent Velsicol "AR50," 6 percent "Triton X155M"
34 percent water

Plot 3.
10-10-100 Bordeaux "AR60" and
Emulsifiable DDT containing ½ lb. DDT dissolved in 390 cc Velsicol "AR60" and
20 cc "Triton X155M"

Plot 4.
4.8 lbs. tribasic copper sulfate
50 percent pulverized DDT wettable powder

Plot 5.
4.8 lbs. tribasic copper sulfate
40 percent colloidal DDT dispersion as formulated in plot 2.

Plot 6.
4.8 lbs. tribasic copper sulfate
Emulsifiable DDT as used in plot 3.

Plot 7.
10-10-100 Bordeaux alone in check

All DDT formulations were applied at a rather low rate of ½ lb. DDT per 100 gallons of water in

(*Turn to Page 67*)

[4] Ann. Rept. of the Director Agric. Expt. Station, Univ. of Wis. 1946, Bul. 469, p. 38-39.

TABLE 3.

Residual value of colloidal and wettable DDT in combination with Bordeaux mixture when used for the control of potato insects. DDT applied at 1 lb. per 100 gallons and used with 10-10-100 Bordeaux.

Date of spray	Date of counts	Insect counts per total of 32 sweeps[1]			
		Colloidal DDT & Bordo		Wettable DDT & Bordo	
		LH*	FB	LH	FB
	July 21[2]	300†	3000†	300†	3000†
July 23	July 25	16	113	30	78
	July 31	190	4410	168	611
July 31	Aug. 2	5	560	7	199
	Aug. 8	105	4608	54	779

[1] Four random samplings of 8 sweeps each.
[2] Initial count before first spray was applied.
* LH, Leaf hoppers; FB, flea beetles.
† Insects in excess of numbers given.

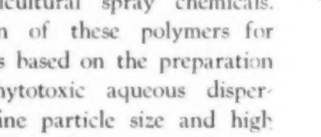
Fungicidal Adhesive

Study of a polymeric organic polysulfide which gives sprays a fungicidal web-like film, highly resistant to rainfall

By S. L. Hopperstead
B. F. Goodrich Chemical Co.

ACCELERATED research in agricultural chemicals was prompted by the necessities of increased food production during World War II. The stimulus to increase the number of new chemicals suitable for agricultural purposes did not fade out with the cessation of hostilities. Facilities for agricultural chemical research have been and are being expanded by both government and private industry and the greater benefits of these programs are already becoming evident.

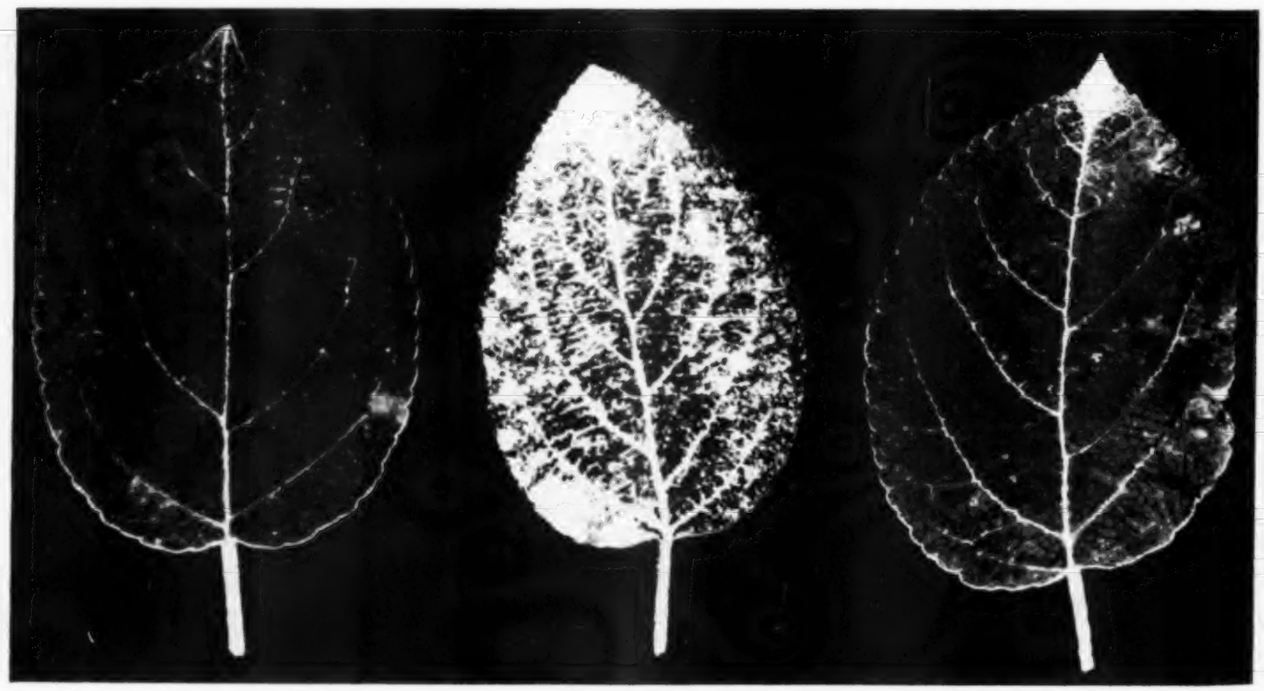
As a part of this intensive war-time research, certain polymeric organic polysulfide latices show promise as agricultural spray chemicals. Adaptation of these polymers for spraying is based on the preparation of non-phytotoxic aqueous dispersions of fine particle size and high stability. One of these recently developed latices when sprayed on plants forms a translucent, elastic, web-like film which is fungicidal, strongly adhesive and highly resistant to rainfall. Freezing, long storage and high temperature appear to have little effect on the material. It is insoluble in water and the usual hydrocarbon solvents. Particle size ranges from one to three microns. An aqueous dispersion containing 40 per cent solids has a pH of 7.0 - 7.5 and a specific gravity of 1.21 - 1.215. This polymer* is of high molecular weight and has a structural formula as follows:



The polysulfide (here designated as p.e.p.s.) is stable to the high pressures of modern spraying equipment and is not affected by high temperatures in the field. The latex is not stable to dehydrating agents such as concentrated alcohols or dry powders. Laboratory evaluations of "p.e.p.s." by both the agar-plate and slide-germination methods have been made. Tests indicate that concentrations of 100 ppm. of the polymer give complete inhibition of growth of *Alternaria solani* and *Sclerotinia fructicola*. Higher concentrations are required to prevent spore germination. In these tests, p.e.p.s. was more active than sulfur. However, unlike sulfur, it was approximately equally toxic to both organisms. It is more toxic than the inorganic polysulfides to *Alternaria solani*.

Greenhouse and field tests un-

*A polyethylene polysulfide being introduced commercially by Goodrich Chemical under the trade designation, "Good-rite p.e.p.s."



Below: center leaf well covered with web-like fungicidal material following heavy rain which had washed off ordinary materials sprayed on other two leaves.

der a wide range of climatic conditions have shown "p.e.p.s." to be safe for use on most plants. Concentrations of ¼ to 1% solids have not produced injury to apple, rose, pear, peach, tomato, potato, eggplant, bean. beet, turnip, onion, peanuts, prune, walnut, and numerous ornamentals nor has it injured certain tubers, corms or seeds. The latex is compatible with the standard insecticides and fungicides and unlike sulfur, may be used in combination with oil.

Adhesiveness is an outstanding property of the polymer and has been responsible for many of the excellent results obtained in the field. Droplets of the spray on drying form microscopic, rubbery, web-like films which are insoluble in water and oil and are resistant to weathering. On admixing with other spray materials, this property is imparted to the resulting spray deposit. Results of analysis made from leaf samples collected one month after the last spray application was made and which had been subjected to a total precipitation of 5.65 inches are shown in table 1. The official A.O.A.C. method was used for the determination.

TABLE 1

Arsenical residues resulting from use of polyethylene polysulfide.

1945 Data

Treatment	Mgm As_2O_3/sq.in. leaf surface
Control—Lead 3+Lime 3.....	.182
P.e.p.s. 1+Lead 3+Lime 3...	.370
P.e.p.s. 2+Lead 3+Lime 3...	.418
P.e.p.s. 2+Ferric dimethyl dithiocarbamate 1+Lead 3	.392
P.e.p.s. 2+Bordeaux ½-3-100+Lead 3.....	.437
Ferric dimethyl dithiocarbamate 1+Lead 3.....	.219
Bordeaux ½-3-100+Lead 3	.247

All dosages expressed on the basis of 100 gallons of spray mixture. Lead 3=acid lead arsenate 3 lbs. Lime 3=hydrated spray lime 3 lbs.

Due to its adhesive character, "p.e.p.s." renders satisfactory for use in spray programs chemicals normally lacking in tenacity. An example of this is shown when used with lauryl isoquinolinium bromide. While highly fungicidal for apple scab control, the recommended dosages of this material do not persist sufficiently long to insure satisfactory results during conditions optimum to the disease. Table 6 illustrates the increased control obtained when the two fungicides are combined. Similar results are obtained when used with many other water-soluble fungicides and insecticides.

TABLE 2

Tenacity of Spray deposits after six weeks weathering.
New Paltz, New York—1945

Treatment	% Sulfur Dry Weight Basis	Mgm S/sq. in. Leaf Surface
Dry Wettable Sulfur 10 lbs./100 gal.....	0.31	0.19
P.e.p.s. 2 lbs.+Dry Wettable sulfur 10lbs./100 gal.	1.84	1.09
P.e.p.s. 2 lbs./100 gal.....	0.73	0.54

"P.e.p.s." latex is a suitable adhesive for sulfur as shown in tables 2 and 3. Apple foliage sprayed with a mixture of dry wettable sulfur and the latex has shown visible sulfur deposists after six weeks of weathering with intermittent rains totalling 9.7 inches. No residue was visible on foliage sprayed with sulfur alone. (Unpublished data have confirmed these results). At the last meeting of the New York State Horticultural Society, Dr. D. H. Palmiter presented the results of his 1946 apple scab control experiment in the Hudson Valley. Dr. Palmiter's experimental results show that superior control was obtained with half-strength dry wettable sulfur and one-half pound of "p.e.p.s." than with full-strength flotation sulfur paste.

SOME of the standard spray materials injure plants. Injury from such materials is accentuated on addition of the polymer due to rapid build-up of spray deposit and increased residue of the toxicant. Arsenical injury on the apple, incurred on spraying with high dosages of lead arsenate, is augmented by the use of "p.e.p.s." due to the increased deposit. Build-up of spray deposit is often so rapid, even under conditions of high rainfall, that dosages should be reduced to avoid injury. In such cases, reduction in dosage by one-third to one-half is suggested.

"P.e.p.s." has been tested as a fungicide under conditions extremely favorable to disease development. For example, the apple scab tests were conducted under conditions of high and frequent rainfall combined with optimum temperatures for growth and sporulation of *Venturia inaequalis*. Tables 4, 5 and 6 are illustrative of the performance of the latex.

Seven sprays of "p.e.p.s." applied for control of apple scab at two week intervals between April 8 and July 4, 1945 resulted in the control shown in table 4.

The latex was also tested in Delaware during 1945 under conditions favorable for apple scab. In these tests the initial application was delayed until the disease had become well established on both foliage and fruit. The results were favorable.

The 1946 apple scab experiments conducted in Delaware and New York have substantiated the results of the previous season. It is interesting to note that the season just

TABLE 3

Tenacity of Sulfur Spray Deposits to Apple Foliage. 1946 Data.

Treatment	Total Sulfur in Grams
P.e.p.s. 2 lbs.	.0222
P.e.p.s. 2 lbs.+Flotation Sulfur Paste 6-5-4.....	.0304
P.e.p.s. 2 lbs.+Flotation Sulfur Paste 8-7-6.....	.0312
P.e.p.s. 2 lbs.+Flotation Sulfur Paste 12-10-8.....	.0403
Flotation Sulfur Paste 12-10-8.....	.0186

Analysis of 300 discs ¾ inches in diameter.
100 discs taken from 3 of 5 replications per treatment.

past is considered by many workers one of the worst apple scab seasons on record and in general, control of this disease in most commercial orchards was far from satisfactory.

When used as an adjuvant in insecticide mixtures, the polysulfide has given promising performances. When properly formulated and used in accordance with directions and suggested precautions, it has proven a helpful addition to mixtures used for control of many insects. It has been used in numerous codling moth control experiments as a sticker for wettable DDT powders. The efficiency of mixtures containing the latex is indicated in Tables 7 and 8. Although the data and the source must be withheld pending further testing, deposition and retention of DDT to foliage of crops other than apples has been outstanding in many cases where the polymer was used.

Instances have also been noted where the performances have been passive or adverse. Most of such results have been traced to the presence or use of wetting agents in the mixtures. It has been shown during the 1946 season that wetting agents, spreaders or dispersing agents should not be used with "p.e.p.s."

"P.e.p.s." has been tried other than as a fungicide or adhesive for pesticides in spray mixtures. Promising data have been obtained when, using the "slurry method," the diluted latex was applied to certain seeds to hold seed treatment chemicals. It has afforded protection from fungous attack to tree wounds and to cuttings in roots media and has also been shown to be valuable in the waterproofing and rot-proofing of bags, wood, tarpaulins and similar materials.

Another interesting use of the polymer is as one component of fruit-thinning sprays. When used in combination with certain other chemicals in post-bloom applications, fruit set has been reduced as much as 50%. Using this chemical combination, rapid thinning is accomplished after the danger of frost is past, without injury to foliage or remaining fruits, and at a saving compared to hand-thinning. The polymer alone does

Turn to Page 71

TABLE 4

Apple Scab Control--1945—New Paltz, New York.

Treatment	Per Cent Infected Leaves Red Delicious	McIntosh	Rome
P.e.p.s. 2 lbs./100 gals.	0.4	7.0	1.0
P.e.p.s. 4 lbs./100 gals.	0.9	1.7	0.4
P.e.p.s. 2 lbs.+Dry Wettable Sulfur 10 lbs./100 gals.	0.4	0.9	1.0
Dry Wettable Sulfur 10 lbs. 100 gals.	9.0	42.0	15.0
Check — Unsprayed	71.0	100.0	100.0

TABLE 5

APPLE SCAB CONTROL DATA—1946

McIntosh Variety—Freer Orchard—New Paltz, New York

Treatment	Average Percent Fruit Infected June 12	September 5
P.e.p.s. 1 lb.	10.9	53.6
P.e.p.s. 2 lbs.	1.9	21.7
P.e.p.s. ½ lb.+Dry Wettable Sulfur 3 lbs.	1.5	28.5
Ferric dimethyl dithiocarbamate 1 lb.	14.4	72.1
Dry Wettable Sulfur 6 lbs.	3.9	33.7

TABLE 6

APPLE SCAB CONTROL EXPERIMENT

Red Delicious Variety—1946

Treatment*	Avg. % Clean	Avg. % Fruit Infected Medium & Severe
Check	0.0	100.0
Lauryl isoquinolinium bromide (15% active) 1 pint	14.0	77.0
P.e.p.s.—2 lbs.+Lauryl isoquinolinium bromide (15% active) 1 pint	63.0	32.0
Ferric dimethyl dithiocarbamate 1½ lbs.	68.0	25.0
P.e.p.s. 2 lbs.+ferric dimethyl dithiocarbamate 1½ lbs.	77.0	18.0
Flotation Sulfur paste 12-10-8	69.0	22.0
P.e.p.s. 2 lb.+Flotation Sulfur paste 12-10-8	88.0	4.0
P.e.p.s. 2 lbs.+Flotation Sulfur paste—8-7-6	79.0	14.0
P.e.p.s. 2 lbs.+Flotation Sulfur paste—6-5-4	75.0	19.0

*Dosages indicated are for 100 gals. spray mixture. Variable dosages of flotation sulfur paste represent pre-bloom, bloom and first cover dosages respectively. Infected fruits were present prior to first application.

TABLE 7

Codling Moth Control Experiment 1945—Rome Variety

Treatment	% Clean	% Wormy	% Stung	# Stings per 100	# Worms per 100
Check	3.0	89.5	36.4	51.2	204.7
DDT (wettable powder) 1 lb.	71.0	10.0	20.7	29.5	11.0
P.e.p.s. 1 lb.+DDT (wettable powder) 1 lb.	81.2	3.5	16.5	24.2	3.7
Bordeaux ½—3+DDT (wettable powder) 1 lb.	75.8	2.7	23.8	34.5	3.5

Records from total of seasonal drops and harvested fruits.

TABLE 8

Control of Codling Moth on Red Delicious—1945

Treatment	% Clean	% Wormy	% Stung	# Stings per 100	# Worms per 100
Check	2.5	97.0	70.2	115.6	187.0
Lead 3 Lime 3	14.2	24.2	84.2	271.0	25.2
Bordeaux ½—3 Lead 3	17.4	22.8	79.2	220.4	26.2

Records from total of seasonal drops and harvested fruits.

P.e.p.s. 1 lb. Lead 3 Lime 3	32.4	17.9	62.6	152.5	20.0

THE Louisiana legislature in 1944 appropriated ten thousand dollars "for the purpose of making a study and conducting experiments to find a way to eradicate and destroy" alligator weeds. Acting under the authority of this law, the Louisiana State University assigned the job to Clair A. Brown and W. H. Carter, members of the University faculty.

After two years of study and experimentation, it was found that hormone weed killer, containing substances absorbed by the leaves or stems of a plant and transmitted to its other parts, provides the most effective way to destroy this particular weed which for many years has been robbing growing crops of moisture, soil nutrients, and fertilizers, causing a reduction in yield.

To Brown and Carter it seemed logical that the effectiveness of any chemical for the control of alligator weeds does not depend so much on killing the top of the plant as it does on injury to the root system. It was noted that it was sometimes several weeks after spraying or dusting operations before the alligator weed begins to wilt. The leaves later turn yellow and drop off, and the stems swell at the nodes, become brittle and gradually die.

During this period of waiting, the experimenters noted the effect of 2-4-D on rice and sugarcane plants, finding that when sugarcane stalks from the sprayed rows were cut and the juice analyzed, there was no evidence that the 2-4-D compounds had any effect on the sucrose or purity of the juice and there was nothing to indicate that the yield of cane was decreased. The men also found that there was no appreciable injury to growing rice after it had received the poison.

Dr. Brown reports that the action of 2-4-D seemed normal inasmuch as the growth processes of the plant were disturbed. A few hours after treatment the weeds become slightly wilted, the stems were seen to bend and twist, and in time produced curious malformations.

During 1946 more than 1200 acres of rice lands were dusted with such weed killers by the use of airplanes. Despite the fact that results were highly satisfactory, Dr. Brown still warns that although these compounds are being tested on a large scale, much technical work still needs to be done before specific recommendations can be made.

Other Weed Problems

FOR many years alligator weeds had limited their habitat to freshwater bayous, lakes and lagoons. Later, they began covering the banks of drainage ditches, giving fields the general appearance of strip-cropping, but no one thought of them as being particularly dangerous to agriculture. Their invasion of rice and sugarcane fields nevertheless seemed to come as suddenly as a locust plague. A sudden realization of the extent to which this aggressive weed had carried on its invasion was the factor that caused alarm to spread among Louisiana planters. The alligator weed seems to have come originally from Brazil. It first appeared in the United States in Florida, in 1894. A report of R. S. Cocks, dated July 11, 1898, indicates that he was the first to discover its appearance in Louisiana: "I have found three species in this State, all of them in the vicinity of New Orleans," he writes. "The first one, *Telanthera maritima*, which can be distinguished by its blunt leaves and short peduncle, deserves notice, for it shows some tendency to rival the celebrated water hyacinth (Piaropus Crassipes) in choking up our bayous." Cocks later reported: "There is a canal near Milneburg, which during the summer was completely filled by it."

But these warnings by Cocks went unheeded for more than forty years. Until the legislature made an appropriation in 1944 there had been no serious effort made to devise methods of controlling this pest. It is true that as early as 1935 Dr. Clair A. Brown, in an article published in the *Louisiana Conservation Review*, called attention to the threatening character of the plant. W. T. Penfound and T. F. Hall of Tulane University also published brief accounts of the biology and anatomy of the plant.

Knowing the basic chemicals in hormone weed killers and also being familiar with the characteristics of the plant, Brown and Carter were able to launch into the control work without delay. Study of the plant had acquainted them with the plant's physiology. The stem of the weed, just below the surface of the ground, contains nodes from which grow either fine fibrous roots or storage roots. Above the ground the stem is made up of nodes and internodes, with a pair of leaves at each node.

"A plant," said Dr. Brown, "may produce several stems which spread out over the ground early in the season. As the other plants crowd about, the alligator weed sends up shoots from the procumbent stems, which may attain a height of five feet. In water, the vine-like semi-floating

Because of drift problems, airplane application of 2,4-D not used in small areas, but this method has proved to be satisfactory over swamp land where aquatic weeds abound over many acres.

stems extend 15 to 25 feet away from the banks of the stream. These branch and rebranch and send out upright shoots from the nodes and in time form a dense mat. Occasionally these mats break loose from the shore and form floating islands."

In various stages of rice culture the fields are flooded, thereby making an ideal home for alligator weeds. Oftentimes infested bayous are the sources of the water supply for irrigation, accounting for the manner in which fragments of the stems and roots get into the fields and from which the infestation begins. The plant does not normally produce seed in this environment, the method of reproduction being from the roots, which will produce additional shoots.

The intrusion of alligator weeds into sugarcane fields has been slower and was made possible only by careless farming methods. In cleaning ditches, the plants and roots were often thrown upon the end of crop rows. From here they would be dragged into the fields by plows or other machinery.

After concluding that 2-4-D would kill alligator weeds, Brown and Carter were confronted with two important questions: What other plants will this chemical kill? By what practical and economical method can 2-4-D be applied in large quantities over wide areas?

The investigators knew that more than 7,000 acres of sugarcane had been dusted by airplane in 1945, applying over three thousand pounds of cryolite for the control of cane borers. The report of A. L. Dugas, Associate Entomologist at Louisiana State University, indicated that he was favorably impressed with the use of planes. "It is not only faster than any other method but also makes it possible to apply dust at the right time, regardless of wet field conditions," he said. Such logic was applicable to the problem of spreading hormone weed killer over a large area, *and at the right time*. This knowledge, plus data on the application of insecticides on cotton fields to control boll weevil induced Brown and Carter to use airplanes in the application of 2-4-D to rice and sugarcane fields.

Early in their experimental use of a plane, however, a windy day caused the dust to drift away from the sugarcane field to a cotton field just beyond a narrow pasture strip. In a few days it was feared that the cotton crop in this nearby field would be lost. Such unfortunate experiences have helped ground spraying to become the preferred method of application.

In the effort to destroy water hyacinths, it is possible, however, that weed killers in the form of dusts will be used extensively upon water bodies of the Gulf coastal region. In swamp areas remote from garden and field plants, dust can be applied from planes without danger to other property.

Continue Control Efforts

THE state of Louisiana and the Federal Government have spent more than two and a half million dollars in attempts to find some method of controlling water hyacinths which are a menace to navigation, to drainage, and to fish propagation.

After studying reports of tests and experiments, by Brown and Carter, the Louisiana Department of Wild Life and Fisheries went before the legislature and succeeded in receiving an appropriation of two hundred thousand dollars with which to begin a new plan of war against these water weed pests. The feeble control attempts of the past, mostly through the use of mechanical devices, had but little to show as results.

The new weapon of 2,4-D weed killers promises good results, however. The Louisiana Department of Wild Life and Fisheries has appointed a superintendent, giving him the title of "State Hyacinths Control Supervisor," and he is ready to begin a state-wide program. Even so, W. T. Penfound of Tulane University recently stated that in the light of new discoveries, the cost of eradicating these weed pests would exceed a million dollars the first year and the annual expenditure of fifty thousand dollars for at least a decade thereafter.

But from the U.S. Department of the Interior, through its Division of Fish and Wildlife Service, comes an ominous note reminding users of 2,4-D that "There is potential danger to fish life any time large masses of floating vegetation are killed and allowed to sink. Decaying plant tissue pulls a lot of dissolved oxygen out of the water. Our game fish must have 3 to 5 parts per million of dissolved oxygen to survive under ordinary conditions."

Since it has been definitely established that dusting or spraying with 2,4-D materials from airplanes is the most practical and economical way to destroy alligator weeds in rice and sugarcane fields, as well as controlling water hyacinths on Gulf coastal streams, those with responsibility of ridding the state of such troublesome pests hope to continue this activity.

Economic Poisons

Labeling Problems[1]

by

Allen B. Lemmon

Chief, Bureau of Chemistry, California Department of Agriculture

DEVELOPMENT of the many new organic chemicals for use for pest control has complicated labeling procedures and created many new problems. A satisfactory label for an economic poison should identify the product, set forth the composition of the material, and also explain how the product is to be used, with warning against any new hazards. The statement of ingredients should be sufficiently definite so the composition can be checked for uniformity, as well as provide sufficient information to enable one to compute proper dosage and compare its relative value with other products for the same purpose.

The Economic Poisons Article of the California Agricultural Code provides that on the application for registration the name and percentage of each active ingredient and total percentage of inert ingredients must be stated. On the label, this same statement is acceptable, or in lieu thereof, the name and percentage of each inert ingredient may be given. With the newer products it is preferable to give the name and percentage of each active ingredient on the label in order that all may have advantage of recommendations and data from the different investigators. With the more complex chemicals it is sometimes difficult to state definitely which are active ingredients and which are inert ingredients. Some chemicals resulting from a particular manufacturing process consist of a mixture of several isomers and related constituents. Isomers are chemical compounds made up of the same numbers and kinds of atoms but each is put together in a different way. They may resemble one another somewhat as a right hand glove resembles a left hand glove. Some isomers have almost identical chemical properties, but others differ greatly. If the various isomers were all of equal insecticidal value, it would not be of particular significance to state which ones were involved; but since they frequently vary greatly in toxicity, it is important that each constituent be stated. It is not acceptable to include inert ingredients among the active ingredients in a product, nor is it generally acceptable to include several different active ingredients under one name. Each of the newer agricultural chemicals must be considered on the basis of the information available. As further information is developed, the labeling should be revised, if necessary. Each must be considered as an individual problem, although the general legal principles of labeling must be kept in mind at all times. Chemicals involving labeling problems include:

Dichloro diphenyl trichloroethane. The term "Dichloro diphenyl trichoroethane (Setting point 89° C. minimum)" in the statement of ingredients on the label of an economic poison has a definite meaning. It is accepted to mean that the percentage stated represents the percentage of the para para isomer of DDT, plus the percentage of the other isomers of DDT. This percentage should not include any impurities in DDT Technical Grade, because such impurities are not accepted as dichloro diphenyl trichloroethane. The percentage of impurities is usually small under present manufacturing practice and seldom exceeds from 2 to 5 percent. The percentage of the para para isomer of DDT must be stated separately from the total percentage of the other isomers of DDT upon application for registration, and the sum of these two percentages should equal the percentage given for dichloro diphenyl trichloroethane on the label. The addition of the term "(DDT Setting point 89° C. minimum)" following the term "Dichloro diphenyl trichloroethane" on the label merely means that the dichloro diphenyl trichloroethane in the product is derived from the regular technical grade material with the usual isomer relationship. There may be some confusion on this point, as it has been noticed that several official samples of material labeled DDT 50% have been found upon analysis* to contain only about 47.5%, which caused them to be reported deficient. It would be equally acceptable, and indeed preferable, to state the composition on the label as well as on the application for registration of a product containing DDT as,

Active ingredients
Para para isomer of dichloro diphenly trichloroethane xx%
Other isomers of dichloro diphenyl trichloroethane xx%
Inert ingredients ..... xx%

[1] (Delivered before Summer Meeting, Pacific Insecticide Institute, Los Angeles, California, May 13, 1947).

* The analytical method for the determination of DDT used by the California Bureau of Chemistry was developed in the laboratory.

BHC

PRENTOX BENZENE HEXACHLORIDE

A PRENTOX PEST-TESTED PRODUCT

You've *heard* about BHC—the amazing *new* insecticide. Now you can actually *buy it*—and step ahead of all competition in the field.

PRENTOX BENZENE HEXACHLORIDE is one of the most potent insecticides ever tested, yet appears one of the safest. It is less toxic to warm-blooded animals than many other insecticides. It evaporates gradually, completely; leaves no dangerous residues at harvest time.

PRENTOX BENZENE HEXACHLORIDE acts three ways—as a fumigant, a contact poison, a stomach poison. It is deadly to many insects now difficult to control—boll weevil, leafhoppers, aphids, lice, ticks, wireworms, Japanese beetles and grubs, etc.

PRENTOX BENZENE HEXACHLORIDE will be used against cotton insects—on truck crops—against shade-tree and greenhouse pests—for protecting stored grains—on livestock—against soil-infesting insects. Household insecticides and mosquito and cockroach control operations may also find it useful.

PRENTOX BENZENE HEXACHLORIDE will be available first as BHC Dust—a dry free-flowing powder containing 5% of the active gamma isomer, with particle size adjusted to develop optimum vapor pressure. Later on in the season, Prentox BHC will be available in liquid concentrate and miscible oil forms.

Place your order now to assure earliest possible shipment.

R. J. PRENTISS & CO., Inc.

110 William Street, New York 7, N. Y. • 9 So. Clinton Street, Chicago 6, Ill.

PLANTS: BROOKLYN, N. Y. AND NEWARK, N. J.

Hexachlorocyclohexane. The terminology and proper ingredient statement for DDT has caused much discussion, but it was mild compared to the confusion concerning hexachlorocyclohexane. The product usually referred to as benzene hexachloride is 1,2,3,4,5,6 hexachlorocyclohexane. Although the chemists generally accepted hexachlorocyclohexane as a preferable name, it seemed difficult for some persons to pronounce. Thus benzene hexachloride is being used as the common name. This material has also been referred to as "666" because of its chemical formula which is $C_6H_6Cl_6$, but this terminology has led to further confusion. A drug company manufactures "666 Cold Preparation" and "666 Liquid for Malarial Symptoms," and holds patents on the trade-mark "666." This firm is taking decided exception to calling hexachlorocyclohexane or benzene hexachloride "666." The compound has also been called BHC, HCCH, GBH, and Gammexane.

The usual commercial product consists of a mixture of at least five isomers of this compound together with certain unavoidable inpurities. From an insecticidal standpoint, the gamma isomer is considered the most important and most entomological results are based on the content of this isomer. The other isomers of hexachlorocyclohexane are of so much less insecticide value that many have considered them unworthy of a guarantee, but since they may be of some value, acceptance as active ingredients has been given within the meaning of the Federal Insecticide Act. On account of the relative importance of the gamma isomer, its percentage is stated separately from that of the other isomers and the usual statement of ingredients shows:

Active ingredients
Gamma isomer of hexachlorocyclohexane (or of benzene hexachloride) ...xx%
Other isomers of hexachlorocyclohexane (or of benzene hexachloride) ...xx%
Inert ingredients .....xx%

Unlike DDT, where the percentages of the respective isomers are not required to be stated on the label, (although required to be given on the application for registration) products containing hexachlorocyclohexane show the gamma isomer separately from the other isomers both on the label and on the application for registration.

Chlordane. When the chemical compound 1,2,4,5,6,7,8.8-Octachloro-4,7-methane-3,4,7,7-tetrahydroindane came into use, something had to be done to find a reasonable common name. Mixtures containing this compound were being sold on the market under the tradenames "Velsicol 1068" and "Octa-Klor." In order to avoid confusion, the name Chlordane has been coined and trademarked by the Federal Government for public use with the intent that it shall be used as the common name for this specific chemical compound. Technical Chlordane is the commercial product containing 60% to 75% of chlordane together with 25% to 40% of other related compounds normally resulting from the manufacturing processes and all considered active ingredients under the Federal Insecticide Act. The coining of a common, easily-pronounced word to take the place of an involved chemical name is a new departure in economic poisons nomenclature. Until the name becomes fully established, it is recommended that the label should contain the equivalent percentage in terms of the chemical names when "chlordane" is shown as the name of the active ingredient. It is possible that after the coined common name has received wide acceptance and comes under general usage, that it alone will be sufficient. This seems to be a constructive, reasonable method of solving a complicated labeling problem. Insofar as the California Bureau is concerned, it would be acceptable at the present time to state both in the application for registration and on the label, the composition of a product simply as:

Active ingredients
Chlordane .....xx%
Other related compounds ...xx%
Inert ingredients .....xx%

As more information becomes available, the nature of the "other related compounds" can be more fully identified.

Chlorinated Camphene. The product having the approximate empirical formula $C_{10}H_{10}Cl_8$, and often referred to as "3956" or by the brand name "Toxaphene," is stated to be the material resulting from the chlorination of technical camphene until its chlorine content is between the limits of 67% and 69%. As the material is now believed to consist almost entirely of chlorinated camphene and the exact structural formula is not known, the term "Technical Chlorinated Camphene," with the chlorine content, is being accepted as the name of the active ingredient. As more information is developed on the chemical composition of these compounds, and more satisfactory analytical methods are devised, ingredient statements of a more specific nature may be required.

Hexaethyl tetraphosphate. The proper labeling of economic poisons containing hexaethyl tetraphosphate has received considerable attention. On account of the extreme toxicity of this material, labels carry a special warning with regard to danger to human beings in addition to the regular poison insignia and antidote. The labels also carry a caution to users against any skin contact with the undiluted material and against prolonged skin contact with diluted spray. Attention is called to decomposition on dilution with water, and that use should be prompt after dilution, because of this tendency. For dusts containing hexaethyl tetraphosphate, the period between manufacture and application must be a minimum. Depending upon distribution and method of packaging, the period is usually indicated on the label as being somewhere within five to ten days. For the information of the user, if he is warned to use the product within ten days of manufacture, the label must state the date of manufacture.

Hexaethyl tetraphosphate has generally been considered one compound, but recent information indicates that this may not be the case.

(*Turn to Page* 71)

OCTA-KLOR

Exhibits HIGH ORDER of TOXICITY

Of major importance to formulators of Agricultural Insecticides and to their customers is the susceptibility of the Hemiptera to OCTA-KLOR.

Now these destructive, widespread and resistant bugs can be wiped out with the application of OCTA-KLOR dusts, sprays, smokes or aerosols.

Non-phytotoxic in effective dosages, OCTA-KLOR'S unique physical and chemical properties contribute greatly to the ease and efficiency of formulating and to the effectiveness of agricultural insecticides in which it is the basic toxic component.

OCTA-KLOR (Technical Chlordane) is being produced in 2 grades, refined and agricultural, both of which are 100 percent active insecticidally.

Formulations available from The Dow Chemical Company, United States Rubber Company (Naugatuck Chemical Division), and others. Your request for complete information will receive our prompt attention.

PHYSICAL AND CHEMICAL PROPERTIES

Formula	$C_{10}H_6Cl_8$
Molecular Weight	409.8
Specific Gravity	1.55-1.62 @ 60/60
Weight per Gal.	13.0-13.5 pounds
Boiling Point	175° C. at 2mm.
Color	Refined grade: Pale Amber Agricultural grade: Amber
Odor	Refined grade: Faintly Aromatic Agricultural grade: Mild Cedar.
Solubilities	Completely miscible in all non-polar solvents, including ketones, alcohols, ethers, esters, aromatic and non-aromatic hydrocarbons including deodorized kerosene; insoluble in water.

Julius & *Company*

DENVER, COLORADO

Eastern Sales Office: 11 West 42nd Street, New York 18, New York

Experiments in Chemical Cotton Defoliation[1]

by

P. W. Gull[2] and E. W. Dunnam[3]

EXPERIMENTAL work in defoliating cotton with "Aero Defoliant," or dusting-grade calcium cyanamid was started in 1942 at Stoneville, Mississippi. The varying results obtained from year to year since then have caused researchers to discard earlier thoughts of giving simple recommendations for successful defoliation. Different seasonal conditions were found to have a marked effect on results.

The first experiment involved time and rate of application, and effect of defoliation on the quality of lint and seed. At that time mechanical harvesting was coming into the picture; therefore harvesting methods were also included in the study. The experiments were set up with two objectives—namely, to determine the most satisfactory rate for applying the dust and to study the residual effects. Applications ranging from 5 to 150 pounds per acre were used.

When conditions were ideal, all rates of application defoliated the cotton; however, under the conditions of our experiment, the application of more than 40 pounds per acre tended to cause an undesirable type of defoliation. More dead leaves were left hanging on the plants, to be crumbled and intermingled in the lint. One supposition was that the higher rates, when used under more ideal conditions for defoliation, destroyed the leaf tissue very rapidly, causing the leaf to die before there was time for a layer of abscission cells to form at the base of the petiole. Leaves that were shocked too severely tended to bend more sharply at the petiole and many of them were caught in branches of the plant as they fell. The dried leaf tissue tended to become broken and intermingled with the fiber. This type of trash became "pin trash" and was very difficult to clean out.

Under extremely dry conditions, applications of dust at the very high rates of 60 to 70 pounds per acre failed to defoliate plants. When plants were so drought stricken that they were wilted permanently, very little or no physiological activity took place, and usually no dew was formed at night to activate the cyanamid. However, when the applications were followed by rains, the plants tended to revive and successful defoliation was made in fields where earlier applications had failed.

Another extreme in weather conditions was noticed in 1945 and a lesser extreme in 1946. Both seasons were noted for very wet and cool conditions. In 1945 rains fell late in the summer and early in the fall, and cotton grew unusually rank. The late-summer growth was comparable to second growth, which often occurred. With this type of growth, good defoliation was somewhat difficult. The leaves were killed on the plant, but apparently abscission cells were not formed, and the leaves did not drop. Lighter applications removed enough foliage to faciliate hand picking, but heavier rates were required for fields where mechanical harvesting was done. No residual effects of the nitrogen supplied by the defoliant were apparent in the following crop.

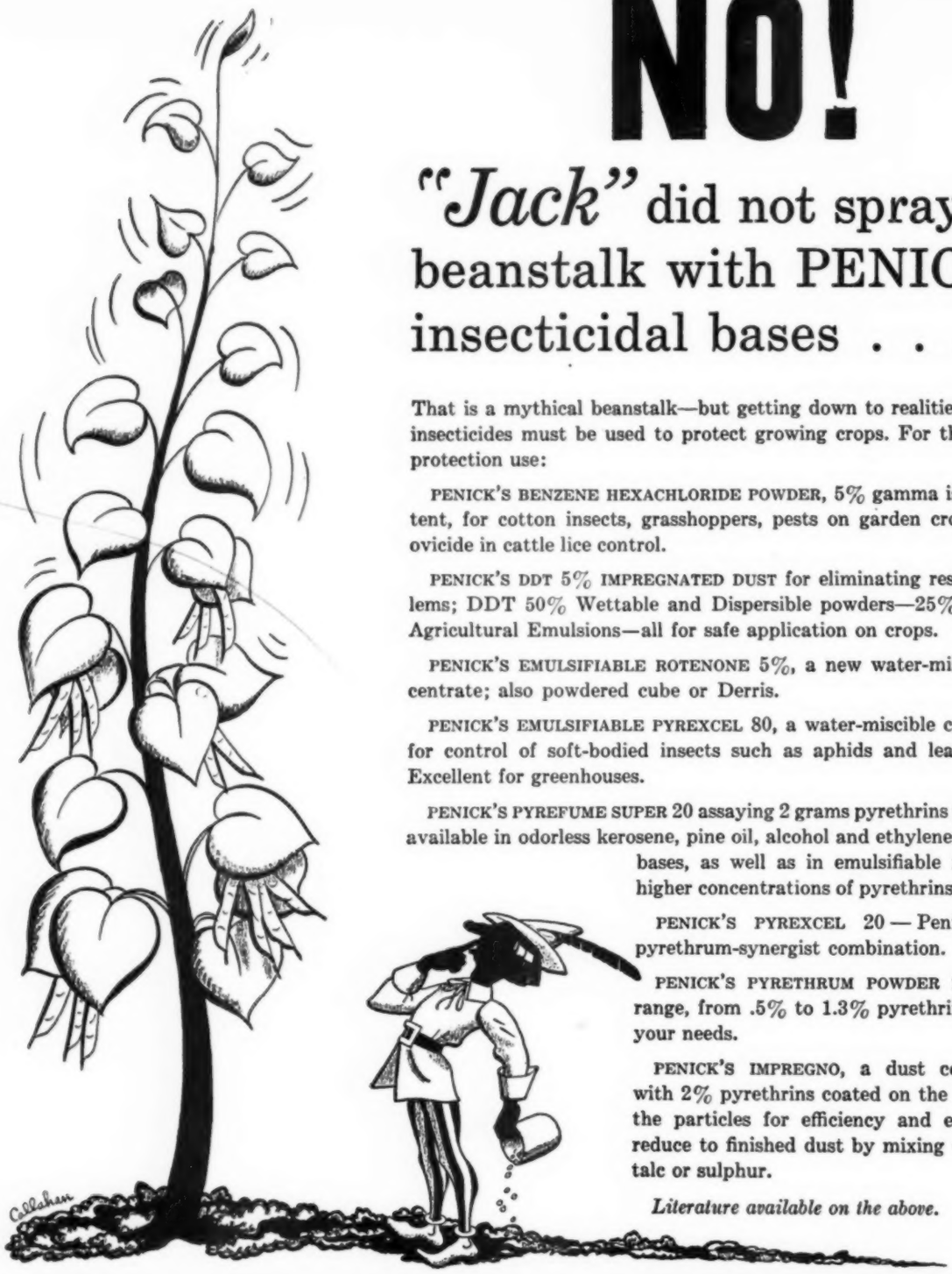
The proper time to apply the defoliant has received much attention during this experiment. At the start of the experiment, an attempt was made to establish the date at which the crop "cut out," or stopped setting fruit. This date varied considerably from year to year according to weather conditions, soil types, variety,

---

[1] Contributed from the Delta Branch Experiment Station, Stoneville, Miss. Published with the approval of the Director, Mississippi Agricultural Experiment Station, State College, Miss. Paper No. 141, New series.

[2] Agronomist, Delta Branch, Mississippi Agricultural Experiment Station, Stoneville, Miss.

[3] Entomologist, U.S.D.A. Agr. Res. Adm., Bureau of Entomology and Plant Quarantine.



NO!

"Jack" did not spray his beanstalk with PENICK'S insecticidal bases . . . . .

That is a mythical beanstalk—but getting down to realities, effective insecticides must be used to protect growing crops. For that greater protection use:

PENICK'S BENZENE HEXACHLORIDE POWDER, 5% gamma isomer content, for cotton insects, grasshoppers, pests on garden crops and as ovicide in cattle lice control.

PENICK'S DDT 5% IMPREGNATED DUST for eliminating residue problems; DDT 50% Wettable and Dispersible powders—25% and 30% Agricultural Emulsions—all for safe application on crops.

PENICK'S EMULSIFIABLE ROTENONE 5%, a new water-miscible concentrate; also powdered cube or Derris.

PENICK'S EMULSIFIABLE PYREXCEL 80, a water-miscible concentrate for control of soft-bodied insects such as aphids and leaf hoppers. Excellent for greenhouses.

PENICK'S PYREFUME SUPER 20 assaying 2 grams pyrethrins per 100 cc. available in odorless kerosene, pine oil, alcohol and ethylene dichloride bases, as well as in emulsifiable form; also higher concentrations of pyrethrins if desired.

PENICK'S PYREXCEL 20 — Penick's new pyrethrum-synergist combination.

PENICK'S PYRETHRUM POWDER in a wide range, from .5% to 1.3% pyrethrins, to suit your needs.

PENICK'S IMPREGNO, a dust concentrate with 2% pyrethrins coated on the outside of the particles for efficiency and economy—reduce to finished dust by mixing with clay, talc or sulphur.

Literature available on the above.

and planting date. The first experiment was set up on the basis of applying the defoliant 10, 20, 30, and 40 days after date of cut-out and comparing the treated with the check (untreated) plants. It was found that the 10-day treatment lowered the yield, shortened the fiber, lowered the oil content of the seed, and increased the content of ammonia and free fatty acid, which was injurious. Defoliation at any later date tended to lower the moisture content of seed cotton, lint, and seed, which was beneficial. Therefore, the 20-, 30-, and 40-day applications tended to improve the seed quality, especially under high-moisture conditions where seed moisture was high.

Subsequently, a more refined experiment was initiated, in which blooms were tagged at the height of the fruiting period. The defoliant was applied 20, 30, 40, and 50 days from the date of tagging. In this way the exact age of all bolls in each sample was known. For the early dates of application the seed analysis seemed to be a more exact indicator of the damage than was the lint analysis. In some tests the 20-day application reduced the oil content one-half, and the 30-day application reduced it one-fourth. In general, the 40-day treatment did not injure the seed or fiber, and in some tests improved the seed quality. Tests resulting in improved seed were usually those following a period of wet weather, when the free-fatty-acid content was increased. Free-fatty-acid and moisture contents were often closely correlated. Fiber from bolls 20 and 30 days old was shortened, as indicated by the fibrograph, and showed greater strength, according to Pressley's index. In fiber characters, bolls 40 days old were no different than the checks.

As the cotton cut-out, fruiting stopped gradually, that is, fewer and fewer bolls were set each day until fruiting came to a standstill. Therefore, very little cotton was produced by the few top bolls. Because of this fact, and also because the quality of seed or fiber in over-all samples was not lowered when applications were made 20 days from cut-out, the defoliant should be applied about 20-25 days after the date of the last bloom to set a boll. When waiting longer than 30 days from cut-out, it was noticed that the quality of defoliation became progressively poorer; therefore, progressive defoliations as the season advances are not recommended.

During these tests, there were times when a farmer could have benefited by applying the defoliant earlier than 25 days after cut-out. In very rank cotton and with high moisture conditions, boll rot often took a large toll in the lower bolls. Very light applications of not more than 10 pounds per acre prevented bottom boll rot and permitted the top bolls to mature. In heavy aphid infestations, where a considerable amount of honeydew was present, defoliation caused a material improvement in the grade of the cotton harvested.

Where growth was rank, the rate of hand picking was increased 50 percent by defoliation. In general, the grade of hand-picked cotton was slightly lowered in the experiments at Stoneville; however, for machine harvesting, defoliation improved the quality from one-half to a full grade, and for this reason it has become a logical part of mechanized farming.

Where cotton leafworms had caused partial defoliation several days before the chemical treatments were made, results were sometimes poor. However, where the crop was mature, chemical defoliation before the occurrence of leafworm infestations improved the cotton grades.

Defoliation 20-25 days after cut-out speeded up maturity 10 days to 2 weeks. Early defoliation stopped weevil development by destroying squares and blooms. Regardless of the date of defoliation, no weevils matured in squares before the cotton was killed by frost. Complete early defoliation with heavy rates is now recommended instead of early stalk destruction, which has long been recommended as a boll weevil control measure.★★

•

Pacific Slope Branch Meets

The Pacific Slope Branch of the American Association of Economic Entomologists is scheduled to meet June 23, 24 and 25 at the Claremont Hotel, Berkeley, California. Among those to appear on the program will be Dr. J. I. Hambleton of the Bureau of Entomology and Plant Quarantine, Washington, D. C.; Dr. F. A. Fenton of Oklahoma A & M College, Stillwater, Oklahoma; Dr. T. C. Allen, University of Wisconsin, Madison; and Dr. H. L. Haller of the Bureau of Entomology and Plant Quarantine, Washington, D. C. Dr. Hambleton's paper will be "Plant Survival and Agricultural Production as Influenced by Insect Pollination." Dr. Fenton will speak on "Effects on Solvents on Residual Kill with DDT," Dr. Allen will discuss "Suppression of Insect Damage by Plant Hormones," and Dr. Haller's subject will be "Some Chemical Problems Relating to the Development of New Insecticides."

Additional papers are to deal with DDT on citrus, deciduous and truck crops; Analogues of DDT; Phosphoric acid esters; Chlordane; ethylene dibromide; benzene hexachloride, "3422," "K-1875," "C-420," and other new insecticides; and effect of insecticides on beneficial insects.

•

Insecticide Institute Held

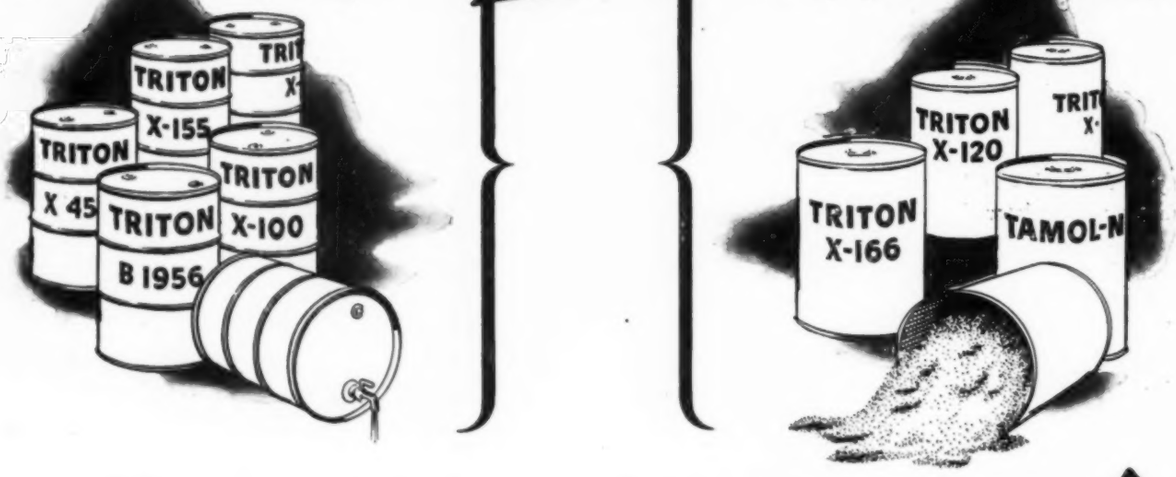
Described as being the most successful meeting in its history, the Pacific Insecticide Institute held its annual gathering on May 13 at Hotel Clark, Los Angeles. Guest speakers at the meeting included Dr. A. M. Boyce, professor of entomology and entomologist of the Citrus Experiment Station, Riverside, Calif.; Roy E. Campbell, entomologist in charge of the U.S.D.A. Bureau of Entomology and Plant Quarantine laboratory; Dr. J. N. Roney, extension entomologist at the University of Arizona; and Dr. Allen B. Lemmon, Chief, Bureau of Chemistry, California State Department of Agriculture. Dr. Boyce and Mr. Campbell discussed experiments with insecticidal materials and equipment, Dr. Roney told of new materials tested in Arizona recently, and Dr. Lemmon talked on problems relating to labeling of economic poisons.* A general discussion of each topic was held by the institute.

* Full text of Dr. Lemmon's talk appears on page 29, this issue of *Agricultural Chemicals*.

For more dependable insecticide sprays

OR

For more efficient insecticide powders



TRY THE TRITONS!

Insecticides and fungicides containing these time-tried emulsifying, wetting and spreading agents have proved themselves superior. TRITON X-100 is included by many U. S. Government agencies in specifications for emulsion concentrates. Whether your formulation is a liquid or a powder, you will find a TRITON to fit your needs. Our research facilities offer fullest cooperation in new developments or data gathered from the widespread use of the TRITONS.

Tritons for use in insecticides and fungicides

FOR LIQUID PRODUCTS

TRITON X-100: High in preference as emulsifier in DDT mosquito larvicides, agricultural sprays and other emulsion type products. Recognized for stability and wetting properties—inexpensive to use. Ideal for formulations of hexaethyl tetraphosphate.

TRITON X-155: Especially developed for use in DDT solvent solutions. An economical emulsifier yet dependable in use with all types of water.

TRITON X-45: An emulsifier for use in oil type agricultural sprays. It is more soluble in oil and less soluble in water than TRITON X-100.

TRITON B-1956: Widely used spreader, depositing agent and emulsifier for oil-base mosquito larvicides, dormant sprays and other oil sprays for fruits and vegetables.

FOR POWDER PRODUCTS

TRITON X-120: A carefully developed wetting agent, especially designed for the powder-type products such as DDT wettable powders. Products containing TRITON X-120 are free-flowing, easily wet and readily suspendable.

TRITON X-166: A wetting, conditioning and dispersing agent for use in the manufacture of dry insecticides and fungicides such as wettable sulfur.

TAMOL N: A conditioner and dispersing agent for use with TRITON wetting agents to furnish ultra-smooth wettable powder products with outstanding suspendability. TAMOL N in conjunction with TRITON X-120 is used in the most efficient DDT wettable powders.

Other TRITONS, *not listed here, are used in a wide variety of industrial and household applications.*

TRITON *and* TAMOL *are trade-marks, Reg. U.S. Pat. Off.*

Canadian Distributor: P. N. Soden & Co., Ltd., Montreal and Toronto. Represented by Cia. Rohm y Haas, S.R.L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals including Plastics • Synthetic Insecticides • Fungicides • Enzymes • Detergents
Germicides • Chemicals for the Leather, Textile, Ceramic, Rubber, Paper, Petroleum and other Industries

Weed Eradi...
CHEM...
in Sod A...

by

Dr. Paul C. ...

AFTER a lawn or golf fairway has been cleared of weeds by the use of 2, 4-D, the numerous weed seeds present in the soil as well as those that may be blown in from bordering areas constitute a continual threat of re-infestation. Of further concern may be the possible accumulative effects of 2, 4-D on the grasses themselves from repeated dosages of the material. To study these factors, some of the older sod plots that were treated with 2, 4-D in August and September 1944, have been maintained for a period of 2 years at the Plant Industry Station, Beltsville, Maryland.

Plots that were established in sod heavily infested with narrow-leaved plantain in which the old weedy plants were eradicated by 1000 p.p.m. concentration of 2, 4-D spray (1¾ lb. 2, 4-D per acre) in August, 1944, developed an appreciable amount of seedling plantains in the spring of 1945. Application of 500 p.p.m. concentration of 2, 4-D was sufficient to eradicate these seedlings so that the plots were free of weeds throughout 1945 and 1946 until the present time. Although these plots were not reseeded they have been fertilized each year and the Kentucky bluegrass, fescue, and redtop sod has developed into a tight stand which seems to retard further the development of weed seedlings. Certain plots have received three applications of the 1000 p.p.m. spray in August 1944, April 1945, and September 1945. The grass in these plots has shown no apparent ill effects from the 2, 4-D and in the absence of weeds has changed from the original weedy, thin sod into a dense weed-free sod. In some instances plots had been infested with dandelions which were eradicated by a single application of 1000 p.p.m. 2, 4-D spray in August 1944. These plots have not shown any appreciable amount of new weeds during the succeeding 2 year period.

The costly spraying equipment necessary for treating large areas with 2, 4-D seemed to be a limiting factor in using the chemical for weed control. Preliminary experiments started in September 1944 indicated that 2, 4-D could be applied in the dry form in mixture with sand, ground clays, ammonium sulfate, or other materials as the carrier and so facilitate application of the small amounts of 2, 4-D that are required. Later experiments have dealt with dry mixtures of 2, 4-D with complete fertilizer. One objective was to reduce the cost of application by combining the 2, 4-D with recommended lawn fertilization practice.

Weedy sod plots have been treated with mixtures of complete 10-6-4 fertilizer containing varying amounts of 2, 4-D (acid) so as to apply 600 lb. per acre of fertilizer containing 1½, 3, 6 or 9 lb. per acre of 2, 4-D. The applications have been tested in fall and spring. The fall treatments appear to be somewhat better than spring. For instance, fall treatment even at the lowest 1½ lb. rate of 2, 4-D has given excellent control of such weeds as narrow-leaved plantain, white clover, and bur-clover without apparent injury to the grass at the highest rate (9 lb. per acre). With the spring application, satisfactory weed control was not obtained at the 1½ lb. rate of 2, 4-D; but at 3, 6, and 9 lb. per acre weed control was excellent. At both 6 and 9 lb. per acre the 2, 4-D caused an appreciable amount of injury to the grass and it recovered very slowly following spring treatment with these rather heavy applications. The applications were made by hand to small plots of 50 square feet or with a fertilizer distributor to large plots. Areas of 1 acre and of 1/6 acre in size have also been treated at the rate of 4 lbs. of 2, 4-D per acre with 300 lb. per acre of 10-6-4 fertilizer, using the fertilizer attachment of a 12-ft. grain drill. Although the mixture was distributed rather poorly, very good killing of plantain, bur-clover and wnite clover was obtained.

All of the dry treatments referred to thus far were with the acid form of 2, 4-D. For comparative purposes a series of plots was treated with various forms of 2, 4-D in which the ammonium, sodium, and morpholine salts (of 2, 4-D) were used at the rate of 4 lbs. per acre in comparison with the acid at this rate. In these tests the ammonium salt was superior in its weed-killing effects to the sodium or morpholine salts, and gave about as good a kill of lawn weeds as the acid.

2,4-D Economically Feasible

EXPERIMENTS are in progress on the use of 2, 4-D in the production of grass seed and are of interest because of the present high cost of seed. A series of Kentucky bluegrass plots that were treated with the mixture of dry fertilizer and 2, 4-D have been maintained for seed production purposes and have shown very promising results from the standpoint of the production of grass seed

(*Turn to Page* 70)

*From talk presented by Dr. Marth before the Greenskeeping Superintendents' Association—18th Annual Convention, New York, February 10, 1947.

These **FACTS** *about*

Compatibility

are important to every manufacturer and user of dust and spray chemicals

Before combining two or more dust or spray chemicals for application to plants, it is important to know whether the materials can be used together conveniently, safely and effectively. This is possible only if the materials are "compatible"—a term which covers three distinct conditions:

Chemical Compatibility

▶ This refers to the reaction which may take place when two materials are combined. If they do not react with one another in such a manner that their effectiveness is impaired, they can be considered chemically compatible.

Physical Compatibility

▶ When physically compatible materials are combined, they form mixtures which can be applied efficiently in all commercial types of applicators. Spray materials should mix readily and give uniform coverage without excess "run-off." Dusts should be free-flowing.

Biological Compatibility

▶ This is the ability of one material to mix with another without reducing the effectiveness of either and without causing injury to the plant on which the mixture may be applied.

Du Pont Dust and Spray Materials, which would normally be used together, are formulated to be compatible chemically, physically and biologically. A chart on the compatibility of Du Pont dusts and sprays may be obtained by writing to the Du Pont Company, Grasselli Chemicals Dept., Wilmington 98, Delaware.

DU PONT PEST CONTROL PRODUCTS

DEENATE* DDT
GRASSELLI* Lead Arsenate
NUREXFORM* Lead Arsenate
ALCOA** Cryolite
BLACK LEAF† 40 and 155
Calcium Arsenate
Paris Green
LORO* Contact Insecticide
ZERLATE* } New Organic Fungicides
FERMATE* }
COPPER-A Compound
SULFORON* } Wettable Sulfurs
SULFORON*-X }
Bordeaux Mixtures
Lime-Sulfur
Flotation Sulfur Paste
Zinc Sulfate (Flake)
KRENITE* Dinitro Spray
Dormant Spray Oils
Summer Spray Oils
PARMONE* Pre-Harvest Fruit Drop Inhibitor
Du Pont Spreader-Sticker
2,4-D Weed Killer
AMMATE* Weed Killer
Special Dust Mixtures
LEXONE*-50 Hexachloro-cyclohexane

*Reg. Trade Mark of E. I. du Pont de Nemours & Co. (Inc.)
**Reg. Trade Mark of Aluminum Co. of America
†Reg. Trade Mark of Tobacco By-Products & Chemical Corp., Inc.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Toxicity Data on Piperonyl Cyclohexenone

A SUMMARY of toxicity studies on piperonyl cyclohexenone was released in May by the insecticide division of Dodge & Olcott, Inc., New York. The report indicates that the compound alone and in conjunction with various commercially used diluents, solvents and synergists exhibits rather low toxicity to warm-blooded animals, and should be safe for use in the agricultural field on animals and on fruit and vegetable products.

Because of the fact that piperonyl cyclohexenone, like piperonyl butoxide (for which toxic data was issued some months ago by D&O) is greatly synergized by pyrethrins, it will be used in nearly all cases in the form of the corresponding pyrethrum concentrates.

The product, commercially, consists essentially of two closely related compounds. One is a complex alkyl, methylenedioxy-phenyl, derivative of carbothoxy-cyclohexen, and the other is an alkyl methylenedioxy-phenyl derivative of cyclohexen, both being present in reasonably unvarying proportions to the extent of about 80% of the total. The remaining 20% of the product consists of other closely related chemicals all of which are approximately equal in insecticide value but not yet identifiable individually as to structure.

Acute oral toxicity tests run on piperonyl cyclohexenone showed the following figures for the LD-50 in ml.s per kilo:

Undiluted

Rats	7.5-10
Rabbits	5-7.5
Cats	over 10
Dogs	over 7.5

"Pyrenone Emuls. Conc."
(4% pip.cyclohex.—0.2% pyrethrins)

Rats	over 5

Diluted 50/50 with D&O solvent "C"

Rats	5-7.5
Rabbits	over 5

Subcutaneous toxicity tests indicated that the LD-50 of piperonyl cyclohexenone injected in this manner into rats is above 10 ml. per kg. and that the chemical is quite non-toxic and non-irritating even when placed within the body-tissue. Comparative eye irritation tests were made on the eyes of rabbits, cats, and dogs with undiluted piperonyl cyclohexenone, with 5% oil solution containing 5 gms. piperonyl cyclohexenone, 0.5 gm. pyrethrins, 20 gms. isopropyl alcohol solvent, and made up to 100 mls. with deodorized base oil, and finally with a 5% water emulsion (T-56) containing 5 gms. piperonyl cyclohexenone and 0.5 gm. of pyrethrins per 100 mls. The latter aqueous solution was prepared by dilution from an emulsifiable oil concentrate containing four times this concentration of the two insecticides plus necessary emulsifiers and solvents. It was found that no eye irritation hazard was introduced by use of the compound in insecticides, and none was involved in use of the tested oil and water solutions as insecticides.

The same three solutions used in the eye tests were applied in 0.25 ml. amounts to the closely clipped skin of rabbits, on both intact and superficially abraded areas, in order to determine primary skin irritation. The primary skin irritation was low for all three solutions: 0.3 for undiluted piperonyl cyclohexenone, 0.1 for the 5% oil solution, and 0.2 for the 5% water emulsion.

In determining the amount of chronic skin irritation and toxicity on rabbits, nine 0.25 ml. doses of the three solutions were applied to the skin for a period of three weeks. The rabbits were treated with amounts of from 0.6 to 2.5 ml.s per kilo. of the undiluted chemical and from 0.03 to 0.1 mg. per kilo for the oil and water solutions. None of the three solutions caused marked irritation to the skin on repeated application and it was concluded that application of small doses of a 5% water emulsion of the chemical to rabbit skin is non-irritating, that a 5% oil solution of the chemical is no more irritating than oil alone, and that even undiluted piperonyl cyclohexenone is only very mildly irritating to the skin. These findings largely substantiate those run during the war by the Food and Drug Administration and the National Institute of Health.

No tests were set up to cover finished insecticides because of the wide range of possibilities as to diluents or other additives.★★

•

Comments on Fertility Bill

SECRETARY of Agriculture, Clinton P. Anderson, in speaking before the Senate Agricultural Committee on May 29, stated that "Congress should establish a national fertilizer program." He said that the nation needs to step up its production of fertilizer and safeguard fertilizer minerals resources, but that such development should be done by private industry. The development of "sufficient plant facilities to supply the liming material and fertilizers needed for a long range soil improvement program at prices in keeping with efficient production and distribution" should be one of the aims of such a program, he said. Other aims should include the "widespread adoption of better farming systems, which are facilitated by use of adequate amounts of liming materials and fertilizers," and the "exploration, utilization and conservation of deposits of fertilizer and minerals."

The Secretary indicated that he plans to propose a substitute for S. 1251, soil fertility bill now being considered.

Others, too, have added their weight in opposition to the bill. Ralph B. Douglass, vice-president of the Smith-Douglass Co., Norfolk, Va., testified that it seems illogical to reduce certain worthwhile USDA projects now in effect, and at the same time pass other legislation requiring millions of dollars for a program less effective in accomplishing the desired objectives than presently organized agencies. West Coast fertilizer manufacturers described the proposed bill as "unnecessary, wasteful, impractical, discriminatory, inconsistent and vicious."

Stauffer
CHEMICALS
SINCE 1885

Announcement

D D T

Dichloro-Diphenyl-Trichloroethane

Now Manufactured On the Pacific Coast

Manufacturing started May 12 and the plant when in full production will produce several hundred thousand pounds monthly. This new Pacific Coast source of supply of D D T will be available for Agriculture and Industry.

Exclusive Sales Agents

STAUFFER CHEMICAL COMPANY

555 South Flower St., Los Angeles
420 Lexington Ave., New York
M & M Building, Houston, Tex.
636 California St., San Francisco
North Portland, Oregon
221 N. La Salle St., Chicago
Apopka, Florida

Manufacturer

MONTROSE CHEMICAL CORPORATION
OF CALIFORNIA
TORRANCE, CALIFORNIA

Plant Disease

WARNING SERVICE

By Paul R. Miller

THE severe outbreak of tomato late blight in 1946 caught many pathologists, growers, and fungicide dealers unaware. The need was evident for a specific and prompt reporting service to prevent similar unpreparedness if another epiphytotic should threaten.

At a special tomato conference of pathologists and canners, called by the National Canners' Association and Indiana Canners' Association at Indianapolis in the fall, the group adopted a resolution recommending the establishment of a blight information or warning service for 1947 and for as long thereafter as seems desirable. "Such a service," the resolution said, "would contemplate the selection of a key pathologist in each state to gather information on earliest occurrences and progress of blight on tomatoes and potatoes and to forward the same immediately to a control agency for summarizing and prompt return to the cooperating state pathologists. Brief weekly, or even more frequent, reports when critical conditions warrant, are suggested. It would be the responsibility of the key state pathologist to make this information promptly available in their releases through regular extension and other channels."

To fill this acute need for accurate and timely seasonal information, a warning service was established in early February of this year by the Plant Disease Survey of the Bureau of Plant Industry, Soils, and Agricultural Engineering, covering the eastern half of the country including the states east of the Mississippi River plus Minnesota, Iowa, Missouri, Arkansas, Louisiana, and Texas.[1] It was designed primarily with reference to tomato since this crop is seldom affected by late blight in such a severe and destructive manner. Consequently both experience and equip- for control on a large scale are lacking, and epidemiology on the host is less well-known than for potato. However, because of the reciprocal effect of the two hosts in the spread of the disease, it will be equally important to observe both crops.

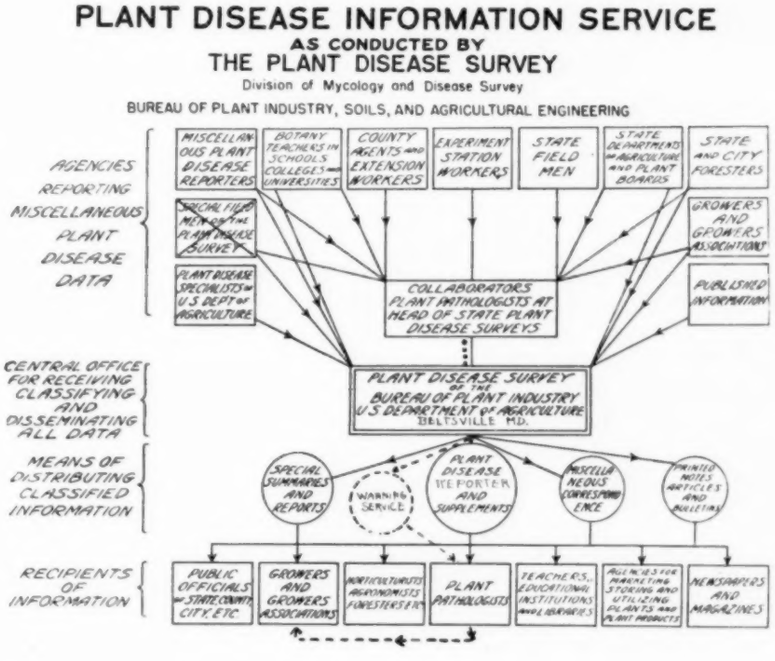
[1] Provinces of Canada as far west as Manitoba are also cooperating in this service.

The warning service operates through key pathologists designated by the chief collaborators of the Plant Disease Survey in the cooperating states. The key men send brief weekly reports on essential facts such as dates and places of earliest appearance, weather of past week, spread to new areas, and losses incurred. The reports are assembled by the Plant Disease Survey into a warning letter and transmitted immediately to the state key reporters. Copies of the reports are also furnished to L. S. Hitchner, Executive Secretary of the Agricultural Insecticide and Fungicide Association, in order to facilitate prompt distribution of the data to interested members of the industry and thus make possible the most advantageous allocation of fungicides both as to place and time.

The method of obtaining information is left entirely to the key pathologists, who are also solely responsible for making this information promptly available in their states, and for issuing control recommendations.

The warning service has already achieved a somewhat undue amount of attention, primarily because of the news-attracting "personality" of late blight. It is obvious that the prominence its activity receives this year will depend entirely on the development of the disease, and that an unsensational season does not mean failure of the service. The serv-

(*Turn to Page 69*)


PLANT DISEASE INFORMATION SERVICE
AS CONDUCTED BY
THE PLANT DISEASE SURVEY
Division of Mycology and Disease Survey
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
AGENCIES REPORTING MISCELLANEOUS PLANT DISEASE DATA
MISCELLANEOUS PLANT DISEASE REPORTERS
BOTANY TEACHERS IN SCHOOLS COLLEGES AND UNIVERSITIES
COUNTY AGENTS AND EXTENSION WORKERS
EXPERIMENT STATION WORKERS
STATE FIELD MEN
STATE DEPARTMENT OF AGRICULTURE AND PLANT BOARDS
STATE AND CITY FORESTERS
SPECIAL FIELD MEMBERS OF THE PLANT DISEASE SURVEY
GROWERS AND GROWERS ASSOCIATIONS
PLANT DISEASE SPECIALISTS OF U.S. DEPT OF AGRICULTURE
COLLABORATORS PLANT PATHOLOGISTS AT HEAD OF STATE PLANT DISEASE SURVEYS
PUBLISHED INFORMATION
CENTRAL OFFICE FOR RECEIVING CLASSIFYING AND DISSEMINATING ALL DATA
PLANT DISEASE SURVEY OF THE BUREAU OF PLANT INDUSTRY U.S. DEPARTMENT OF AGRICULTURE BELTSVILLE MD.
MEANS OF DISTRIBUTING CLASSIFIED INFORMATION
SPECIAL SUMMARIES AND REPORTS
WARNING SERVICE
PLANT DISEASE REPORTER AND SUPPLEMENTS
MISCELLANEOUS CORRESPONDENCE
PRINTED NOTES ARTICLES AND BULLETINS
RECIPIENTS OF INFORMATION
PUBLIC OFFICIALS STATE COUNTY CITY ETC
GROWERS AND GROWERS ASSOCIATIONS
HORTICULTURISTS AGRONOMISTS FORESTERS ETC
PLANT PATHOLOGISTS
TEACHERS EDUCATIONAL INSTITUTIONS AND LIBRARIES
AGENCIES FOR MARKETING STORING AND UTILIZING PLANTS AND PLANT PRODUCTS
NEWSPAPERS AND MAGAZINES

MERCK IS SERVING THE INSECTICIDE INDUSTRY AS A BASIC AND PRIME SOURCE OF SUPPLY FOR DDT

An aerial view of the Main Plant of Merck & Co., Inc. at Rahway, N. J.

As expanding facilities come into operation and current commitments are provided for, we are finding increasing opportunities to co-operate with manufacturers of "DDT" insecticides.

The product we offer is —

DDT

TECHNICAL

(dichloro-diphenyl-trichloroethane)

Setting Point 89° C. Minimum
For Manufacturing Purposes Only

Write us for prices and let us know your requirements. Please address your inquiry to the Insecticide Products Department, Merck & Co., Inc., Rahway, N. J.

DDT TECHNICAL

For the Manufacture of Agricultural, Livestock, Horticultural, and Household Insecticides

MERCK & CO., Inc. RAHWAY, N. J.

Manufacturing Chemists

New York, N. Y. • Philadelphia, Pa. • St. Louis, Mo. • Chicago, Ill. • Elkton, Va.
Los Angeles, Calif. • *In Canada:* MERCK & CO., Ltd., Montreal • Toronto • Valleyfield

MERCK

Comments....

By Dr. Alvin J. Cox

This column by Dr. Cox appears as a regular feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief, Bureau of Chemistry, California State Dept. Agriculture in 1932, retiring in 1945.

THERE are serious prospects of a heavy cut in the budget of the United States Department of Agriculture. It would be dangerous if a reduction in the appropriation were to be reflected in a more narrow scope of agricultural research activity.

Agricultural research has taken the leadership in lifting farmer operations from superstition and gullibility to proper Government-Industry-Farm relationships. It helps solve the fertilizing, pest control, shipping and other problems of production and marketing of crops as such problems arise. Government aid and stabilization in the use of and cautions for new agricultural chemicals founded on adequate investigation, has prevented much harm from being done. A good example is the excellent work and handling of DDT by government research men. Just now many other chemicals similar to DDT are seeking their market level and require careful and unbiased testing.

The Federal government sponsors State work by matching State funds for experiment stations and for agricultural extension services. This gives the service a familiarity with local conditions, and makes it available to producers and growers who depend upon government investigators to supply the best possible information on agricultural chemicals and the right way to apply them. In fact these men are depended on for aid in other agricultural problems.

Industrial executives and agricultural chemicals managements are unafraid and self-reliant but their decisions must be based on facts, proper interpretations and good judgment. They are more and more served through science. Most companies now try to produce products of merit. Many manufacturers of agricultural chemicals have their own research laboratories and institutions, but the economics of agriculture and the prosperity of the industries involved still depend on government research and guidance.

Facts are learned from trial. There may be many original ideas, but the facts still must be established by experimentation. Government investigators are flexible and more free from pressure or tradition, have adequate facilities, and can furnish unbiased results for the benefit of all.

Direct service to farmers must be provided and maintained. False impressions and erroneous concepts or interpretations are frequently very expensive. That is one reason why manufacturers must more and more require the constant and full collaboration of scientific workers. These trained persons give of their time and energy primarily for accomplishment. It is hoped that governments will be generous toward research.

The knowledge possessed by a farmer helps to shape his life. In this age of specialization and intensification, more and more education and factual scientific information is needed. Accurate diagnoses of problems are necessary. In many cases excessive amounts of economic poisons have been used by farmers, which may make pest control unnecessarily expensive. Naturally the effectiveness of pest control depends on the use of an adequate amount of insecticide but in many cases without proper experimental background the recommendations have been wasteful. Work undertaken without the necessary foundation and without complete knowledge is hazardous. Someone has said that if you want a thing done well, don't do it yourself unless you know how.

A good illustration of unguided activity occurred during World War I. At that time there were insufficient shipping facilities to move the available and much needed coconut oil from the Philippines to the United States. The empty fuel tanks of ships were scoured out and filled with coconut oil. At Philippine temperatures, coconut oil is always in liquid form. But the tanks arrived in New York in winter! The coconut oil was solid, and no steam pipes were available on board to liquify it!

Fortunately, conditions have changed. Most manufacturers now recognize their moral responsibilities and are respected for their efforts. It is no longer a case of having merely something to sell, but there is a real desire on their part to render a service. Their consultations with government experts along broad lines are forward steps and their products are improved thereby. Company laboratories are not substitutes but are largely detail supplements to government laboratories. With the wealth of new and untried materials which have appeared, all government research laboratories having to do with agriculture should be dealt with in a generous manner by Congress.

FRIANITE

the Superior

Insecticide Diluent

Frianite M3x is the product which you read about when a dust carrier is chosen to make an insecticide better. Reference lists on request.

Check these features

1. Super-fineness of 98% minus 325 mesh.
2. pH range of 5.4 to 6.5.
3. Moisture is less than 1%.
4. Bulk density about 47 lbs. per cubic foot.
5. Inert to almost all insecticides.
6. Economical to use anywhere in the U.S.
7. Superior adhesive qualities.
8. Free-flowing . . . "works" easy.
9. Dusts better in field or orchard.

Frianite M3x is shipped direct from the mines and factory at Friant, California, in 100-lb. paper bags. Its many superior qualities make it economical to ship anywhere in the United States.

CALIFORNIA INDUSTRIAL MINERALS CO.
PRODUCERS
FRIANT, CALIFORNIA

THE spring meeting of the Plant Food Research Committee of The National Fertilizer Association featured a trip of inspection through various sections of Florida, April 21-25. Many lines of research activities were observed by the committee in following an itinerary arranged by Frank L. Holland, Director of The Florida Agricultural Research Institute.

Florida farmers are being given the answers to many agricultural problems, by experiment station scientists. It is recognized that Florida's soil needs nitrogen, phosphorus and potash, but in addition, many of its varied soils require the so-called secondary and minor elements. In such cases, magnesium, manganese, copper and zinc are considered as essential as nitrogen, phosphorus and potash. Without the application of these elements, when they are needed, fertilizer containing the usual three nutrient elements cannot give the most satisfactory results.

Climate in Florida varies from temperate to subtropical and the extreme variation in soil types is greater than in most agricultural states. The soils range from fine sand, low in organic matter, to muck soils in the Everglades; from acid soils such as are commonly found in humid climates to the marl soil in the Homestead area; and from heavy soils in the north to stony soils in the extreme south near Florida City. Each of these soil types is supporting a prosperous agriculture.

Eleven branch experiment stations have been located conveniently in various parts of the state. One of these is at Gainesville, where the Committee observed the response of oats to copper treatment; saw the effect of zinc treatment on white bud of corn; and viewed the response of both pasture grasses and cattle to the proper use of minor elements. When grazing on a fertilized legume-grass pasture, cattle were reported to gain three times the weight of those left on an unfertilized pasture. Legume stands have been increased by nitrogen applications and effective inoculation. New strains of white Dutch clover that withstand hot dry weather were growing on sandy land.

At the Citrus Experiment Station at Lake Alfred, the results of research work are correlated into a unified program of recommendations for citrus growers. The results of experiments of soil technologists, agronomists, horticulturists, pathologists, entomologists and other workers are integrated into one program for action. A tour through the station's citrus grove indicates that these recommendations are producing quality fruit. Standardization of cultural practices such as fertilization and spraying is being achieved through this cooperation. An example of a grade of fertilizer recommended for citrus fruit is 4% nitrogen, 6% phosphoric acid, 8% potash, 3% magnesium oxide, 1% manganese oxide, and ½% copper oxide.

From Winter Haven a side trip was made by the committee to visit the prosphate deposits near Mulberry. R. E. Fuller, manager of the International Minerals and Chemical Corporation's Florida Phosphate Division, and his associates described the methods used in uncovering, washing, screening and grading phosphate rock.

Proceeding down the Florida peninsula to Brighton, the Committee and their guests called on Jesse Durrance who has converted "salt sick" land into excellent grazing land by applying fertilizer and copper to the soil. He also gives the cattle other needed minerals in their drinking water.

At the Everglades Experiment Station muck land produces outstanding crops of celery and other vegetable crops. As much as three to four tons of fertilizer per acre are applied to celery. Pastures also grow luxuriantly when mineral fertilizers including copper are used. One of the pasture plots included in an experiment at this station produced beef at the rate of a ton per acre annually.

At the Subtropical Experiment Station near Homestead, the visiting group saw groves of avocados, as well as tomatoes and other crops growing luxuriantly on soil prepared by scarifying soft rock. The prepared seed bed appears to be made up principally of stones but through added chemical nutrition, it is supporting a thriving agriculture.

Near Florida City, the last town on the southern tip of the Florida mainland, potatoes are grown on a marl soil. Here, the water table is usually so near the surface that a system of canals has been devised in order that the water table can be lowered during wet seasons or raised if occasion demands.

Members of the NFA Plant Food Research Committee include the following: H. B. Siems, Swift & Co., Chicago, Chairman; T. F. Bridgers, Farmers Cotton Oil Co., Wilson, N. C.; B. E. Brown, Summers Fertilizer Co., Inc., Baltimore; C. J. Cahill, Rath Packing Co., Waterloo, Ia.; E. N. Carvel, Valliant Fertilizer Co., Laurel, Del.; Joseph A. Chucka, Eastern States Farmers' Exchange, West Springfield, Mass.; J. E. Culpepper, Spencer Chemical Co., Kansas City, Mo.; Leroy Donald, Allied Chemical & Dye Corp., Goodman, Miss.; Robert H. Engle, NFA, Washington; S. D. Gray, American Potash Institute, Washington; E. E. Hendricks, Knoxville Fertilizer Co., Knoxville, Tenn.; G. N. Hoffer, American Potash Institute, Inc., Lafayette, Ind.; F. L. Holland, Florida Agricultural Research Institute, Winter Haven, Fla.; F. G. Keenen, E. I. duPont de Nemours & Co., Inc., Wilmington; D. D. Long, International Minerals & Chemical Corp., Chicago; R. H. Lush, NFA, Washington; Wallace Macfarlane, Pacific Guano Co., Los Angeles; H. B, Mann, American Potash Institute, Inc., Atlanta; R. D. Martenet, E. Rauh & Sons Fertilizer Co., Indianapolis, Ind.; M. E. McCollam, American Potash Institute, San Jose, Calif.; H. H. Tucker, Coke Oven Ammonia Research Bureau, Columbus, Ohio; and Nelson T. White, Smith Agricultural Chemical Co., Columbus, Ohio.

PYRETOX 100

■ After four years of practical unavailability we can again offer adequate quantities of PYRETOX 100 for use in the manufacture of agricultural dusts.

■ PYRETOX 100 is an impregnated pyrethrum dust base of 200 mesh fineness containing a minimum of 1% pyrethrins and mixes readily with any of the usual diluents though Pyrophyllites and talcs are preferable.

■ The advantages in effectiveness, stability, and economy of properly impregnated pyrethrum bases over pyrethrum powder have been too fully demonstrated over a period of years to require elaboration. One pound of PYRETOX 100 is roughly equivalent in effectiveness to two pounds of 1% pyrethrum powder and is much less expensive.

■ PYRETOX 100 is indicated wherever a pyrethrum dust is needed or whenever it is desired to step up the activity of DDT or other ingredients by the addition of pyrethrum.

D&O DODGE & OLCOTT, Inc.

Insecticide Division: 60 EAST 42ND STREET, NEW YORK 17, NEW YORK
General Offices: 180 VARICK STREET, NEW YORK 14, NEW YORK
Branches: BOSTON • CHICAGO • PHILADELPHIA • ST. LOUIS • LOS ANGELES
Plant and Laboratories: BAYONNE, NEW JERSEY
Canadian Agents: STANDARD CHEMICAL COMPANY LIMITED, 195 FLEET STREET E., TORONTO, CAN.

Use and need of

Insecticides in California

by

Stewart Lockwood

Supervising Entomologist, California Department of Agriculture

IN an attempt to answer the many requests as to the amounts and types of insecticides needed to protect growing crops in California during 1947, estimates have been made similar to those for 1942 and 1943. It was soon found that data was lacking on amounts used in homes and barns, and for materials needed to protect ornamentals or nursery stock. No attempt was made to include disinfectants for livestock or poultry, wood preservatives nor, with the exception of sulfur, materials used to control plant diseases.

Sources of information include reports of county agricultural commissioners, and farm marketing associations; representatives of manufacturers or distributors of insecticides; statistics of crop acreages and probable trends in crop acreages; and personal observations and conversations with farmers. Differences or discrepancies between individual sources were compared and re-estimated after conference or correspondence.

Estimating the amounts would be simple if a formula could be developed reflecting the amount used per unit of crop, the total number of units and the percent customarily treated in a given area. Such a formula would result in showing an annual use of over 10,000,000 pounds of standard lead arsenate to control the codling moth on apples and pears alone, but the amount used for this purpose was far less before the advent of DDT, to complicate the picture further.

Besides acreage in various crops, other factors must be considered. These factors include the number and size of fruit trees per acre of orchard; various formulae used in different parts of the state; effect of sales promotion on the volume of different materials for the same pests; effect of the price of the crops sold by the farmer on the amounts of materials he will use, as well as the fluctuation in the population of insects.

Some of these factors are unknown, non-determinates which no amount of past experience can weight accurately. Use of insecticides, like other commodities, is governed by the availability of the materials within easy reach at the time needed. Fire departments don't pump much water if they arrive after the building has burned down. At least for a time in 1947, the amounts of insecticides available may be influenced by a short supply of bags and other containers. It takes tremendous amounts of heavy paper to hold between 68 and 85 million pounds of dry insecticides. Metal drums may also be in short supply. Prompt return of refillable containers is helpful in meeting the need.

Regardless of available checks and counter-checks which have been used, there are so many variable factors which influence the use of insecticides, that one wonders if after all preparations have been made, the entire structure might collapse.

Standard Lead Arsenate

From 3,000,000 to 4,000,000 pounds are used, principally for codling moth on apple and pear, also for foliage feeders such as elm leaf beetle. Some will be used on stone fruits since growers have found the foliage to be hardy to standard lead in some areas where only basic lead arsenate was considered safe in past years. There is a possibility of some standard lead arsenate being used on avocados. In many areas DDT will replace part of the lead arsenate previously used on apples, pears and walnuts.

Basic Lead Arsenate

From 2,000,000 to 2,500,000 pounds, used principally on stone fruits for the peach twig borer and codling moth on walnuts. Some of this type of lead arsenate may be used against the codling moth on apples and pears in the coastal area where standard lead arsenate has resulted in russeting fruit. DDT has not yet been tried extensively on stone fruits and grower preference for the change has not been so emphatic.

Calcium Arsenate

From 3,500,000 to 4,000,000 pounds, used principally as a straight dust for tomato fruit worms or combined with sulfur for fruit worms and russet mite; for loopers on peas, climbing cutworms and near relatives on various crops and miscellaneous pests on vegetables when such are very small plants. In some areas, considerable calcium arsenate has been used on cotton. The probabilities are that this last use will be replaced when control is necessary by DDT. Considerable quantities of calcium arsenate will be used in making snail bait.

Paris Green

From 6,000 to 10,000 pounds, used principally in grower prepared bait for small darkling ground beetles and small field infestations of grasshoppers.

Fluorine Compounds

From 3,500,000 to 4,000,000 pounds, used principally for tomato pests, tortrix worms, walnut husk fly and cutworms on beets, cabbage, cauliflower and other vegetables. When necessary, this product will be used on beans which, under California conditions are very susceptible to arsenical burn. A greater amount would be used on tomato vines except for the fact growers are afraid of horn-worms which are more readily controlled by calcium arsenate. The price differential has also favored calcium arsenate. Considerable quantities of calcium arsenate will probably be replaced by DDT by tomato growers because of less danger from drifting dusts lodging on alfalfa and other forage crops or plants frequented by bees.

Sabacide

[Activated SABADILLA Concentrate]

FOR THESE "HARD-TO-KILL" INSECTS

SQUASH BUGS • HARLEQUIN BUGS

CHINCH BUGS • STINK BUGS

LEAF FOOTED BUGS • TARNISHED PLANT BUGS

Dust containing SABACIDE has proved to be highly effective and economical in controlling the "hard-to-control" insect pests. Mixers have used Sabacide for two years now with gratifying results. Our cooperation is given when desired in formulating effective insecticides containing Sabacide.

MANUFACTURED UNDER LICENSE FROM WISCONSIN ALUMNI RESEARCH FOUNDATION

Proved by widespread research confirmed by broad field use.

PLACE YOUR ORDER PROMPTLY

Write for free booklet "The Story of Sabacide".

Insecticide Division

McCONNON & COMPANY

WINONA, MINNESOTA

DDT

From 4,000,000 to 7,000,000 pounds of dusts and spray material to be used this year. Estimates of the use of this insecticide are quite difficult. Certainly a large quantity of standard lead arsenate will be replaced by DDT for codling moth control. However, the desire on the part of apple, pear and walnut growers to use DDT to the exclusion of lead arsenate has tempered and is not as dominant as at picking time last year. During this lapse of time growers have considered the possible effect on various red spiders which have been responsible for considerable loss, and on aphids and mealy-bugs which are now of less importance over most of the state. Should a combination of DDT and sulfur continue to be successful in tomato pest control, expanded use at the expense of calcium arsenate is expected, if prices of the two commodities are comparable. A considerable increase in cotton acreage treated with DDT is indicated. A combination dust of DDT and sulfur was effective in control of Lygus bugs and bean thrips on cotton, and the red spider population did not increase to damaging numbers in 1946. Two applications of this dust to 60% of the cotton acreage would use 12 million pounds of a DDT bearing dust.

Sulfur

From 50,000,000 to 60,000,000 pounds, used principally on grapes and beans for mildew and as a carrier of insecticides, for red spiders, fruit drying and soil conditioning.

Tartar Emetic and Sugar

20,000 to 40,000 pounds of each commodity for thrips control on citrus, beans and others. Continued success in control of thrips by DDT and other complex organic chemicals will reduce the quantities of these two products.

Nicotine Alkaloid

200,000 to 350,000 pounds, used principally for aphids on citrus,

walnuts, peas, deciduous fruit trees and most all commercial food crops and leafhoppers on grapes. Regardless of the use of some of the newer insecticides which have been used during the shortage of nicotine, there is still a demand and urgent need for nicotine. Use of nicotine against aphids has increased with the greater volume of vegetables being sold for processing rather than in the fresh trade.

Pyrethrum

From 200,000 to 300,000 pounds of flowers or the equivalent extractives. Principal use for leaf feeding insects on cherry, apricot, plum and prune, grape leafhoppers and beet leafhopper. DDT was used extensively in the control of the grape leafhopper and may replace a large quantity of other materials used for this pest. However, in some areas mealybugs and red spiders are of considerable importance and may build up where any material is used that is destructive to their predators and parasites over a period of time.

Derris, Cube, Rotenone

From 900,000 to 1,000,000 pounds of dusts containing rotenone. Principal use for certain aphids, leaf feeding insects on cabbage, cauliflower and related plants, celery, and for preharvest use on tree fruits when such are attacked by sudden outbreaks of insects.

Hydrocyanic Acid

From 1,000,000 to 1,500,000 pounds, used principally for scale insects on citrus. The use of this insecticide is influenced by the availability and cost of trained labor as well as canvas, duck or drill for fumigation tents. Just previous to the war, it was reported that there was an annual need for 800,000 yards of cloth just mentioned to replace torn or worn out tents.

Calcium Cyanide

From 100,000 to 200,000 pounds, used principally for grape leafhopper, for black scale in some citrus and olive groves and in fumigation chambers. In the past, great quantities of this insecticide have been used on grapes for leafhoppers, especially after a low spring rainfall. DDT may replace much of this in some localities.

Di-nitro Products

From 1,000,000 to 1,500,000 pounds. Principal use for red spider on citrus, hops and other crops, for aphids on some deciduous tree crops.

Tar Oils

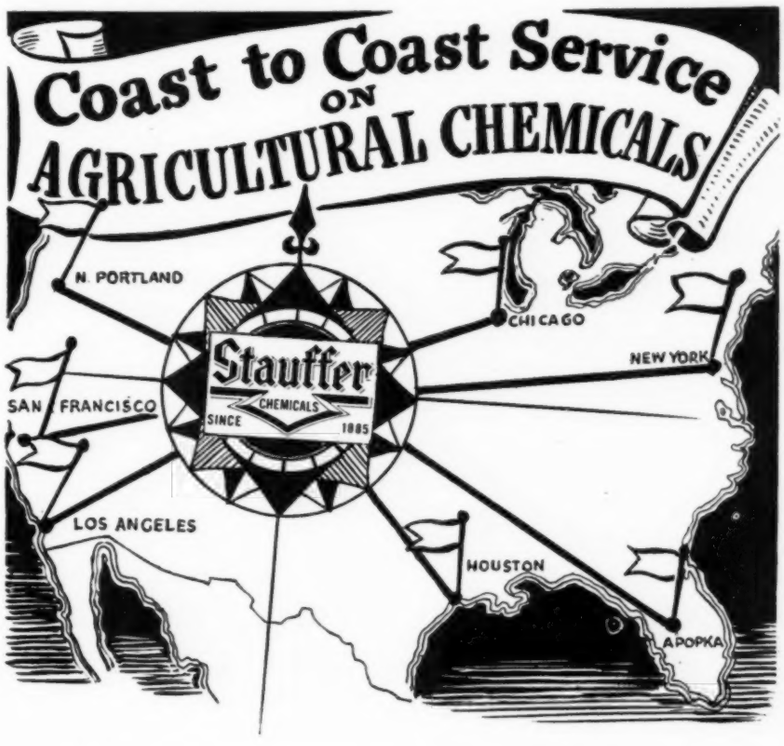
Approximately 20,000 gallons. Principal use for aphids on plum, prune and apple.

Thio-cyanates

10,000 pounds, for control of mealybugs, certain aphids, cucumber beetles and soil infesting insects.

Dormant Season Spray Oil

From 1,250,000 to 1,500,000 gallons. Largely for scale insects and overwintering eggs on deciduous fruit trees.



Stauffer Agricultural Chemicals are at your service. A complete line of insecticides, fungicides, spraying oils, stock dips and soil conditioners are conveniently stocked in every agricultural section of the country. Check off your needs on the following list of Stauffer Agricultural Products:

SULPHURS
- Burning
- Dusting
- Wettable
- Soil
- Mixtures

DDT CONCENTRATES AND MIXTURES
CARBON BISULPHIDE
TARTAR EMETIC
ROTENONE
ROTENONE-SULPHUR
PYRETHRUM
PYRETHRUM-SULPHUR
CRYOLITE
CRYOLITE-SULPHUR
CALCIUM ARSENATE
COPPER-SULPHUR DUSTS
SPRAYING OILS
SOIL NUTRIENTS

STAUFFER CHEMICAL COMPANY

420 Lexington Avenue, New York 17, N. Y.: 221 North LaSalle Street, Chicago 1, Illinois: 636 California Street, San Francisco 8, Calif.: 555 South Flower Street, Los Angeles 13, Calif.: North Portland, Oregon: Houston 2, Texas: Apopka, Florida.

STAUFFER *Guaranteed by its name*

Foliage Spray Oil

From 7,500,000 to 8,500,000 gallons, used principally on citrus for scale insects, red spiders and other mites. Considerable may be used on deciduous fruit trees and a much lesser amount on walnuts.

Lime-Sulfur

From 1,500,000 to 2,000,000 gallons, used principally on deciduous fruit trees for scale insects, blister mites on pears, European red mites and others. A much smaller amount on citrus for citricola scale. A considerable quantity will also be used for tree fruit diseases.

Soil Insecticides

Between 1,000,000 and 6,000,000 pounds, for wireworms and other soil infesting organisms. The use of such materials is more dependent on availability of applicating machines and cost of the treatment than other factors. There is a sufficient acreage of vegetable and field crops infested with soil inhabiting pests to use even greater quantities.

Methyl Bromide

From 200,000 to 250,000 pounds, for fumigation of potatoes, apples and pears in storage or in transit. The quantity used depends to a marked degree on the success or failure of orchard control of the codling moth and the quantity of potatoes shipped into areas free of the tuber moth.★★

Control of Elm Beetle

Geigy Company, Inc., New York, has issued recommendations for treating trees affected by the elm bark beetle and the elm leaf beetle; the latter insect being responsible for carrying Dutch elm disease virus. For control, a 2 percent DDT spray is recommended, followed 75 days later by a 1 percent solution. By use of an oil-DDT spray, dead and dying elm trees could be rendered relatively harmless as sources of infection, the statement says. Oil sprays of such concentration should not be applied to the foliage but only to the trunk and main branches of the elms.

•

Corn Borer Progress

Status of the European Corn Borer in 1946 is portrayed in a U.S.D.A. Bulletin (Special Supplement, N. 4, 1947) by E. W. Beck of the Bureau of Entomology and Plant Quarantine, Cereal and Forage Insect Investigations. Indications are that the borer is still moving westward and southward, with two new states added to the infested area. The total number of states is now 28, with the addition of North and South Dakota.

Abundance of the borers is reported to be generally a little less than 1945, although some states saw considerable increases. Iowa, Minnesota and North Carolina were outstanding in this respect. Unfavorable conditions for second generation borers are thought to be a factor in the smaller populations.

EVERLASTINGLY AT IT!.....

Black Leaf

Yes, TOBACCO BY-PRODUCTS is everlastingly at it — developing products of vital importance to agriculture.

BLACK LEAF — a trademark embracing a comprehensive variety of nicotine-based products.

1. The FAMOUS BLACK LEAF 40—Used as a spray or dust in controlling small insects and plant lice. Also used to control external parasites of cattle, sheep and poultry—and as a drench for sheep.

2. BLACK LEAF 155—for cover sprays for codling moth.

3. BLACK LEAF POWDER AND PELLETS—for controlling the large roundworm in chickens.

4. BLACK LEAF 155 WITH DDT—for control of codling moth and certain other insects.

5. BLACK LEAF 10 DUST BASE—meets the demand for a non-alkaline neutral dust.

6. BLACK LEAF CUNIC DRENCH—for sheep and goats. Formula recommended by U.S. Dept. of Agriculture.

7. BLACK LEAF DRY CONCENTRATE—used either as a spray or base mixture with carrier for dusting.

THE "TOBACCO BY-PRODUCTS" LINE ALSO INCLUDES

8. MASH-NIC—for mixing with poultry feed to control large roundworm.

9. NICO-FUME LIQUID—for greenhouse work.

10. NICO-FUME PRESSURE FUMIGATOR—spreads fumes under pressure when ignited. Saves contact of hands with powder.

PROTECTION For The Farmer » PROFITS For The Distributor

TOBACCO BY-PRODUCTS & CHEMICAL CORPORATION, INCORPORATED
LOUISVILLE, KENTUCKY

The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

Chemical Cotton Seed Treatments

COTTON seed treatments were compared in two tests by the Cotton Seedling Disease Committee in 1946, on seed of the Stoneville B variety well infested with the anthracnose fungus. In one test, the compounds Du Pont "1452F" and "Dow-9B" were used as dusts at the rate of 3g./kg. (1.5 oz./bu.), on fuzzy, lightly - reginned, heavily-reginned, and acid-delinted seed, in 14 plantings in 9 states. Fuzzy and lightly-reginned seed on which the lint had been matted by the application of a 2% aqueous solution of "Methocel," a methylated cellulose, were also included to ascertain the effect of this matting on uniformity of planting and on seedling emergence, with half of the fungicidal dosage, i.e. 1.5 g./kg., applied as a suspension in the matting solution, the other half after matting. The results of this test, measured by number of seedlings surviving at final seedling count, showed that the two compounds were about equally effective, the mean number of seedlings for Du Pont "1452F" being only 0.6 percent greater than for "Dow-9B." In sublots of seed treated with dusts containing 20%, 30%, 40%, and 50% zinc trichlorophenate, compared in several plantings in North and South Carolina, the 50% dust tended to be slightly superior to the others, while the 20% dust was greatly inferior in one planting.

In the other test, the following treatments were compared in part in 11 plantings on two or more kinds of seed: Du Pont "1452F" at 3 g./kg.; Du Pont "1452F" (15%) plus "Fermate" (85%), 10 g./kg.; GCC-668, 3 g./kg.; "Dow-9B," 3 g./kg.; "Dow-9B" (15%) plus "Dow-5," or chloranil (85%), 10 g./kg.; "Dow-9B" (16%) plus "Zerlate" (84%), 10 g./kg.; and a dust composed of 16% dimethylol urea, and 13% "Pyrax ABB," at 6 g./kg. In this test, Du Pont "1452F" and "Dow-9B" were again about equally effective. Their effectiveness was not improved by the addition of "Fermate" or "Zerlate." Except in laboratory tests the combination of "Dow-9B" and chloranil was not superior to "Dow-9B" alone; the dosage of chloranil may have been too high. "GCC-668" was generally less effective than Du Pont "1452F." Tests in North and South Carolina in which this dust was applied at the rates of 1.5, 3, and 6 g./kg. indicated that 6 g./kg. may be slightly more effective than lower dosages. The paraformaldehyde-dimethylol urea dust, generally, was less effective than the Du Pont "1452F" check treatments.

Current Disease Developments

APPLE SCAB. An unusually heavy carryover from last year and abnormally advanced maturity of the apple scab fungus as compared with fruit bud development in Massachusetts, indicates the possibility of severe infection this year if weather conditions become favorable for scab development. Greater care than usual will be necessary to keep trees protected, from the late delayed dormant bud stage onward, in orchards with a prominent scab carryover, especially where a ground spray

Turn to Page 71

Insect Conditions in Late April and Early May

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

CABBAGE caterpillar infestations were reported as present generally in all areas from Virginia southward along the Atlantic and Gulf Coasts and also in southern California during early May. However, only in parts of South Carolina and southern California were the infestations sufficiently severe to necessitate control measures. Very early in May the corn earworm caused considerable damage to 20 acres of young cabbage in the Gulf Coast district of Texas, though damage was not generally heavy throughout the area.

By May 10, the harlequin bug and onion thrips were infesting cabbage in eastern Viriginia and the cabbage maggot was causing losses to spring rutabagas in central Washington. A few vegetable weevils were observed in the buds of cabbage near Florence, South Carolina in late April and a few were reported feeding on collards and sorrel in the Stafford district of Texas. No important damage from this insect has been reported during the past few weeks. Flea beetles caused much damage to seedling plants of radish, kohl-rabi,

turnips and beets in the Palouse district of Idaho and Washington.

The small chrysomelid beetle, *Microtheca ochroloma* Stal, mentioned last month as having been discovered recently in the vicinity of Mobile, Alabama, has continued to injure turnips, collards, radish, and mustard in that area. It is now commonly referred to as the cabbage leaf beetle. Some turnip plantings have been completely destroyed by it and the larvae are abundant in many garden patches in the Mobile district.

The first Mexican bean beetle adult was found in eastern Virginia on April 23 and hatching of the eggs began there during the week ending May 10. By the latter date the insect was causing some damage on spring snap beans in the Charleston district of South Carolina, and was abundant in some southern districts and becoming numerous in the central districts of Georgia. Infestations have been reported as generally light in southern and central Alabama. The insect was reported scarce in Ohio on May 7 and had not yet been observed in northwestern Tennessee by May 10. The Mexican bean beetle eradication program in Ventura County, California was said in late April to be progressing satisfactorily according to schedule. Five miles of windbreak adjacent to previously infested fields was freed of all ground litter, which was burned, and the ground was treated with pyrethrum. The ground litter in about 650 acres of citrus and walnut orchards was similarly treated. By April 1, trap beans had been planted around all infested fields to pick up early emerging adult beetles. The beetles were active early in May in a hibernation cage, but none had been found in bean fields by May 3.

Other pests reported on beans during the last half of April and early May include: a heavy infestation of thrips on snap beans in the Everglades district of Florida, where growers reported unsatisfactory control from airplane applications of DDT; infestations of the bean leaf beetle in Virginia, South Carolina, Georgia, Florida, Alabama, and Tennessee; the spotted cucumber beetle in Georgia and Texas; the seed-corn maggot, the western spotted cucumber beetle, the western potato leafhopper, darkling ground beetles, wireworms, and the two-spotted mite, all in California. Sulfur applications were reported as ineffective against the two-spotted mite in Ventura County, but a benzene hexachloride dust containing one percent of the gamma isomer gave satisfactory control.

Potato Beetle Prominent

COLORADO potato bettles had become abundant by May 10 in parts of Virginia, South Carolina, Georgia, Alabama, Tennessee, and Texas. Cutworms have damaged potatoes and watermelons in Florida and potatoes and hops in Washington. Armyworms migrating from nearby grain plantings caused slight injury about May 1 to a 300-acre potato planting on Johns Island, S. C., before being controlled by an airplane application of 10 percent DDT dust.

Pea aphid populations in-

(*Turn to Page 69*)

At Your Service

Coincidental with the celebration of our 25th year of service to the agricultural and industrial chemical trade, we announce the opening of our new warehouse and plant at Hicksville, Long Island.

Almost 40,000 square feet of well planned storage space enables the maintenance of adequate stocks of all materials. Direct railroad siding and ample platform facilities for truck deliveries and pick-up assure speedy handling and dispatch of all orders. A special department for repacking into small containers of materials heretofore available only in bulk is designed to satisfy a long-felt need of many customers.

Adequately staffed with experienced personnel aided by modern loading equipment, these new facilities will enable us to satisfy every reasonable demand of the clientele which we service in the New England and Middle Atlantic States.

Micro Nu-Cop

For the control of Potato and Tomato Blight. A fixed neutral insoluble Tri-basic Copper Sulphate containing 53% metallic copper for dusting or spraying. No lime required—extremely fine particle size. 2-5 microns.

●

AVAILABLE
From One Source

A complete list of agricultural products for the dealer backed by a quarter century of experience in serving the industry:

INSECTICIDES — SEED PROTECTANTS
FUNGICIDES — FERTILIZERS
FEED STUFFS — WEED KILLERS
And Allied Materials

FAESY & BESTHOFF, INC.
220 East 42nd Street, New York 17, N. Y.
Phone: MU 2-4848 — Cable: Trufabest
Plant and Warehouse: HICKSVILLE, L. I.

Raw Material Markets . .

SUPPLIES of agricultural insecticide materials and fertilizers appear to show a slight easing from the generally tight condition which has characterized reports of the past few months. The late spring has aided somewhat in conserving the supply of insecticides, and early buying of fertilizer materials has caused a reduction in purchases of later months.

Insecticides

The problems of transportation and a supply of containers continue to trouble the insecticide industry, although late reports indicate a slight easing of the boxcar situation. But the shortage of containers, particularly drums and carboys, remains severe. Toxic materials themselves are in varying states of supply. The arsenicals are not expected to meet seasonal requirements, according to the U. S. Department of Commerce. Some major buyers are reportedly continuing shipments to regular buyers and at present are not in a position to accept new orders. Total arsenic imports in February were 27 percent below January's, and the output of calcium arsenate in February was 22,000 pounds less than January's production. (This figure was 35 percent above the output of February, 1946, however). Lead arsenate is reported in short supply, with a possibility that the season's requirements may not be met. February's output of 3,691,000 pounds was 25 percent less than January's, and but half the amount produced in February, 1946. Despite the brevity of other arsenicals, paris green appears to be in sufficient quantity to meet the season's demands.

The supply situation of copper sulfate was described by an industry spokesman on May 27 as being "none too tight," which confirms Department of Commerce reports that maintenance of heavy output through the winter months has eased the supply situation on copper sulfate. The industry also reports that supplies of zinc sulfate are also adequate, and that the supply of insoluble coppers is "improving." Export business has been affected by keen competition from British producers, according to trade sources. February exports totaled 5,937,000 pounds.

Rotenone, according to industry spokesmen, is in more consistent supply than previously, although the stock is "not unlimited." Unless an abnormal infestation occurs during the current year, normal requirements can be met adequately. A number of factors contribute to the improved supply picture. Early demand, plus late crops due to weather conditions have had their effect. An uncertain price structure following the termination of price ceilings in November caused a reluctance on the part of the industry to build up heavy inventories. Instead of going ahead, an attitude of watchful waiting was adopted in the hope of a decline in the price of rotenone-bearing roots. This, of course, resulted in a lowering of over-all supplies. Imports from South America are expected to meet normal requirements.

Pyrethrum again provides a bright spot in the insecticide supply picture. Supplies are reported adequate to meet all requirements for 1947, and imports continue to arrive. February imports of 750,000 pounds were some 20,000 pounds above January's. Exports of pyrethrum totaled 9,000 pounds in February as compared to 19,000 pounds in February of 1946.

Demand for DDT continues to outrun the available supply. The lateness of the season has been favorable to the over-all stockpile, but production of some 4,000,000 pounds monthly does not catch up with increasing demands for the insecticide. An industry representative described the situation as being still in the critical stage, but showing a slight tendency toward easing.

Nicotine sulfate supplies continue to be short, and according to the U. S. Department of Commerce, no prospect for alleviation is in sight. Exports continue at a high rate, some 30,000 pounds being shipped out in February. (More than twice the 14,000 pounds exported in February, 1946).

Affecting the manufacture of aerosol bombs is a lack of freon-12, delivery of which was recently discontinued for an indefinite period. Need of the gas in refrigeration servicing during the hot months was a factor in the matter, but back of that is a shortage of carbon tetrachloride which in turn was affected by a lack of chlorine supplies.

Fertilizers

ALTHOUGH total quantities of fertilizer material delivered probably set a new record during the spring buying season, it is apparent that the demand has exceeded the supply in some localities. Indications are that early buying prevailed, and sales during March and April, peak months before the war, tapered off from those of January and February of 1947. Department of Commerce figures, showing a comparison of monthly fertilizer tax tag sales before the war and since, show very plainly the heavy buying through January, 1947. The National Fertilizer Association report goes further to state that April Tag sales were the highest since 1941.

Production of nitrogenous fertilizer materials in February was up compared to last February's output which had been hampered by the 1946 steel strike. (February 1947's output was 115 percent higher). During the first 8 months of the 1946-47 fertilizer year, 506,000 tons of byproduct ammonium sulfate were produced, compared with 438,000 tons during the corresponding period of last year. Producers' stocks are reported to be higher also. Production of ammonium nitrate declined 6 percent in February, but was still better than the record of February, 1946 due to extra output from former ordnance plants sold or leased to private producers since then. Sodium nitrate production was low

in February, amounting to only 10,481 tons as compared with 25,129 tons in the same month of 1946.

Imports of Chilean nitrate have been delayed, so that observers feared the total amount reaching the U. S. by the end of June might be 15 to 20 percent less than earlier estimates had indicated. Imports of other nitrogenous fertilizers in February were also less than in February of 1946.

Production of normal superphosphate in February hit the highest mark of any February during the past 5 years. Total sales and consumption also reached a record high that month, being 12 percent greater than the output. Producers' stocks were thus depleted somewhat. On February 28, they were down to 614,360 tons, or 136,282 tons less than the year before.

Superphosphate also had a good month in February, output amounting to 28,514 tons (Basis: 45 percent P_2O_5) which was about 13 percent greater than in the preceeding month.

Heavy demands for phosphate rock have given the industry little opportunity to accumulate stocks. Improvement in output is indicated, however, when it is considered that the increasing rate of superphosphate production must be comsuming large quantities of rock.

For the past twelve successive years, deliveries of the 5 leading American potash producers have exceeded those of the preceding year. The record for 1946 was 6.3 percent greater than 1945 deliveries. Of a total tonnage of 923,127 tons K_2O, 790,928 tons were for agriculture in the U. S. and territories, and 75,797 tons were for chemical purposes. The remainder was exported.★★

•

Describes 2,4-D Concentrate

A tremendous increase in the use of 2,4-D in concentrated form was predicted by Dr. N. E. Van Stone, vice-president of Sherwin-Williams Co., Cleveland, in a press conference held in New York late in May. Dr. Van Stone told about experiments made in the middle west, California, and Canadian grain fields. He explained that through use of new application equipment it is possible to distribute the material in extremely fine particles, making practical the use of highly concentrated mixtures. The necessity of carrying large quantities of water in spraying operation is thus relieved.

Dr. Van Stone stated that where from 100 to 200 gallons of 2,4-D mixture was formerly necessary to control weeds, airplane sprayers and other operators in areas where water supply is a problem found it difficult to operate. Under the new method of creating a mist under pressure, from 2 to 5 gallons per acre is sufficient, he said. Actual amounts of active 2,4-D used were small: from 8 to 14 ounces per acre, he reported, and stated further that this amount may go as low as 4 ounces per acre.

Application equipment has been and in some cases continues to be the chief problem in widespread use of 2,4-D in rural areas. Dr. Van Stone indicated that pressure pumps which operate from power takeoffs on tractors are being manufactured, and some will be available soon.

TRIED-AND-PROVEN

DDT Formulations by Geigy Company

• "Originators of DDT Insecticides"

GESAROL* Compositions for Sprays and Dusts on Plants.

NEOCID* Compositions for Livestock Dips and Sprays.

When you sell Geigy GESAROL and NEOCID Insecticides, you sell satisfaction through scientific achievement. These DDT compositions were first in the field. Nation wide, their efficiency has been demonstrated by producers of truck crops, field crops, fruits, cattle and dairy products.

Suggestions for their use are based on eight years of continuous experience in the compounding and application of DDT insecticides. There are some good territories still open for Distributors. Write or wire us now.

*Reg. U. S. Pat. Off. Insecticidal Compositions containing DDT are covered by Reissue Patent No. 22,700.

Geigy

GEIGY COMPANY, INC.
89 Barclay Street, New York 8, N.Y.

ORIGINATORS OF DDT INSECTICIDES

Suppliers' Bulletins

Bean Offers Catalog

John Bean Mfg. Co., Division of Food Machinery Corp., Lansing, Michigan, has issued its 1947 catalog featuring sprayers of various types for orchards, shade trees, golf courses, livestock pest control, and weed killer chemicals. In addition to the listing of spray machinery, the catalog presents a graphic picture story of progress in spraying efficiency, showing how in 1883 two men could spray one acre of trees per day, and by using modern equipment two men can spray 40 acres of trees in the same length of time.

•

U.S.D.A. Yearbook Offered

The U. S. Department of Agriculture announces publication of its new yearbook, 1943-1947, covering recent developments in soil nutrition, insect and plant disease control, and listing the chemicals used for control. The booklet also discusses diseases of domestic animals, and offers suggestions on general farming methods. It is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. for two dollars.

•

Folder Describes Equipment

A folder, "Pest Control Requires Equipment," has recently been issued by John F. Benham, secretary of the National Sprayer and Duster Association, 4300 Board of Trade Bldg., Chicago. The bulletin shows photos of various types of equipment in use, and describes the functions of each, pointing out characteristics of different sprayer models.

•

New Feeder Drive Out

Sprout-Waldron & Co., Muncy, Pa. announce production of a new heavy duty speed feeder drive designed to handle the extra load and high capacity required by most wide mouth feed bins. Features of the feeder drive (type 2520) include wide babbitted and bronze bushed bearings and large diameter drive shafts, accurate speed adjustment mechanism, and heavy, steel-tipped pawls on wide ratchet wheel. Literature describing the machinery is available from the company in bulletin EF-146.

•

"Pyrin 20" Described

A new thirty-six page booklet describing its product, "Pyrin 20", a pyrethrum base insecticide concentrate, has been issued by John Powell & Co., New York. Extra killing power, the brochure says, is gained through the addition of a synergist, "Sesamin" which is said to increase the killing power of the pyrethrum by two or three hundred percent. The bulletin presents charts showing comparative knockdown properties. Also described are various combinations of "Pyrin" with DDT, and charts showing results obtained. Copies are available from the company, 1 Park Ave., New York 20.

•

Lightweight Sprayer Offered

Drumcliff Co., Towson, Md., is marketing a spraying outfit under the name "Airosprayer." The product is described as a "light, simple, all-purpose" sprayer for use in cattle barns, for truck farms, and orchards. It is operated by hand.

•

Ammonia Plant Brochure

Chemical Construction Corp., 350 Fifth Ave., New York, has published a brochure offering a complete description of Nitrogen Engineering Corporation synthetic ammonia plants. Comprehensive flow charts are presented, showing synthetic ammonia production from a variety of hydrogen sources; coke, hydrocarbon gases, or electrolysis of water. Outlines of each phase of production, including gas purification, are included. Numerous photographs provide a hypothetical tour of a typical "Chemico" ammonia plant. Copies of the brochure are available from the company.

•

New Aerosol Gun

Mayfair Industries, Inc., Chicago, announces the development of a new aerosol gun, marketed under the trade name of "Commando." Features of the gun, as described by its makers, include its ability to convert an aerosol concentrate into gas by means of a thermostatically controlled heating process powered by electricity. The gun has no moving parts, and weighs but six pounds. Bulletins on the product are available from the company, Dept. "C," 2442 Irving Park Rd., Chicago 18.

•

"Mistmaster" Booklet Out

Sprayer Corporation of America, Chicago, has issued a number of bulletins on its "Mistmaster" line of insecticide sprayers. Among these are the compressor type for oil-base insecticides only, for dairies, cattle barns, etc.; automatic time-switch compressor type; and a model for spraying both oil-base and water-base insecticides. These pamphlets are available from the company's offices, 1810 W. Winona Ave., Chicago 40, Ill.

•

Valve Bulletin Available

A. W. Cash Valve Mfg. Corp., Decatur, Ill., offers bulletins on its new "Type SY Strainer," and other products used in chemical plants. Bulletin 224 presents information on the "SY" model, designed for pressures up to 250 psi, and available with a wide selection of screens.

•

Dust Diluent Booklet

A book offering the latest information on the properties and commercial sources of insecticide dust diluents and carriers has been compiled by Dr. T. C. Watkins and L. B. Norton of the department of Entomology and Linmology, Cornell University, Ithaca, N. Y. The Agricul-

tural Insecticide and Fungicide Association, 285 Madison Ave., New York City, is distributing the volume. The book is an outgrowth of an effort to investigate the toxicities of inert ingredients used in the manufacture of agricultural insecticide dusts. Information was furnished by scores of producers and handlers of diluents and carriers throughout the U.S. The authors indicate that the present mimeographed book is not to take the place of later works, but that the recently-issued book is merely a release of the sheets of data so far obtained from the diluent companies. The A.I.F. Association offers the book to the trade at cost, $2.

•

Wants U. S. Contacts

A reader of *Agricultural Chemicals* in Italy, the firm of Ditta G. E. Hess, at Turin, distributors and dealers in chemicals for agriculture, has expressed interest in contacting an American manufacturer who wishes to have Italian distribution. The company states that since customs duties are high and freight costly, the Italian firm could repack in smaller units for the trade in that country.

Agricultural Chemicals Annual Index Coming

Scores of inquiries have come in asking whether or not Agricultural Chemicals will publish an annual index of articles. The answer is yes. However, the index will not appear before the December issue which will carry a complete roster of articles printed since Volume I, Number 1, May, 1946, up to December, 1947. Thereafter, the annual index will appear each December, containing all the articles of that year.

—The Editors.

Twin-Spiral Blender Offered

Prater Industrial Products, 1515 S. 55th Court, Chicago, have issued literature on their "Blue Streak" twin spiral mixers for use in blending insecticidal dusts and similar operations. The bulletin describes the machine as being built around two speed twin spirals, the two spirals replacing the usual single one. One spiral revolves at a higher speed than the other, which adds to the efficiency by tossing the material from spiral to spiral with force. According to the bulletin, mixing is constant, thorough, fast, and operation is more silent than with conventional models. The bulletin, B53-3 is available from the company.

•

Liming Conf. in July

The reports of the first year of study in a four-year research program will be heard by the National Lime Association in a closed meeting at Wooster, Ohio, July 9 and 10. The research program is a cooperative arrangement between the association and five agricultural experiment stations: Maryland, New Jersey, New York, Pennsylvania, and Ohio. The July meeting is to be attended only by representatives of the five experiment stations and members of the National Lime Association staff.

Marry Your Product to A GOOD PROVIDER

Every step you take in making your product is aimed at its effective use. But to be effective it must be efficiently applied. A good insecticide, germicide, disinfectant, deodorant or moth spray deserves the most efficient sprayer or duster you can provide.

That is why we say "Marry your product to a good provider"... a sprayer or duster that will assure proper application of your product. There is an especially designed Lowell Sprayer and Duster for every need.

Don't be insecticide-wise and sprayer-foolish. Let Lowell Sprayers and Dusters help build your business. Write us!

LOWELL Manufacturing Co.
DEPT. 62, 589 EAST ILLINOIS STREET, CHICAGO 11, ILLINOIS

WORLD'S LARGEST MANUFACTURER OF SPRAYERS AND DUSTERS EXCLUSIVELY

Technical Briefs

"Toxaphene" for Cotton Pests

"Toxaphene," otherwise known as "3956," manufactured by Hercules Powder Co., Wilmington, Del., shows promise of helping to control insect pests attacking the southern cotton crop, according to entomologists studying the situation. A paper presented at the annual meeting of the Association of Southern Agricultural Workers at Biloxi, Mississippi earlier in the year, by E. E. Ivy, C. R. Parencia, Jr., and K. P. Ewing of the Waco, Texas station stated that "Toxaphene," in tests, had given "excellent control of several of the more important cotton insects in laboratory, cage and field-plot experiments at Waco, Texas in 1946." It went on to describe the tests, reporting that "in cage and laboratory tests, a 20 percent '3956' dust controlled bollworm larvae as well as a 5 percent DDT dust and controlled boll weevils as well as calcium arsenate or a benzene hexachloride dust containing 5.75 percent of the gamma isomer.

"A 10 percent '3956' dust controlled cotton leafworm larvae as well as calcium arsenate, and excellent control of cotton flea hopper adults and nymphs was obtained with concentrations as low as one percent. Twenty percent concentration controlled southern green stinkbugs, cabbage loopers and garden webworms as well as or better than DDT, benzene hexachloride, or calcium arsenate. In a small-plot and a large-plot field experiment, a 20 percent 'toxaphene' dust gave adequate control of comparatively heavy infestations of bollworms, boll weevils, cotton aphids and leafworms. The material was about equal to calcium arsenate in controlling the boll weevil and slightly superior to calcium arsenate in controlling the bollworm."

Special significance is attached to the ability of "Toxaphene" to control such a wide variety of cotton insects. One of the major handicaps in cotton insect control has always been the necessity for using a variety of poisons and control methods. Many farmers, confused at the complicated control recommendations, attempted no control methods at all, or had tried to control only one type of pest.

Observers close to the industry have stated that much of the annual heavy loss due to insects in cotton fields, (an estimated average of $230,546,000 per year) could be averted if control methods could be simplified through use of one insecticide which would kill a wide variety of destructive insects. The role of "Toxaphene" is expected to be important in this respect. At the present, it should be remembered that the material will require further research, it is not yet available for general use, and that the availability of raw materials for manufacture will determine its cost.

•

Potato Ring Rot Control

Copper sulfate, 2 pounds in 10 gallons of water, will eradicate ring rot bacteria on either wooden or metallic surfaces, according to L. Carl Knorr of Michigan State College, writing in the Michigan Insecticide Fungicide *News*. Ring rot, first discovered in the U. S. a decade ago, is now one of the foremost diseases affecting the potato-growing industry. Its control consists of three steps: removal of all potato stocks from infested farms; disinfestation of all surfaces having come in contact with the diseased potatoes, and the procurement of new seed stocks free of ring rot.

Field tests were made with wooden potato crate slats and with metallic surfaces such as diggers, planters, graders, and scoops which come in contact with the tubers. In summary, the data based on 25,200 hand-planted hills, indicates that copper sulfate in the above proportions, will eradicate ring rot bacteria on either wooden or metallic surfaces. Other chemicals, some less corrosive than copper sulfate, also gave good control at proper concentrations; these were, on wooden surfaces, alkyl dimethyl benzyl ammonium chlorides, ammoniacal copper-zinc-phenol, and corrosive sublimate, and on metallic surfaces, various quaternary ammonium compounds and formalin.

•

Cattle Louse Control

New York Agricultural Experiment Station, Geneva, N. Y., has recently published a bulletin (#382) on Cattle Lice, their biology and control, by John G. Matthysse. The booklet is divided into two parts: (1) Economics and biology, and (2) control of cattle lice. Numerous illustrations are presented, a number in natural color, showing various species of the pest and methods of applying insecticides for their control. Among the conclusions drawn from the two-year control experiments were: Dusting is the best control method for cattle lice under New York State conditions. Dusts containing 10 percent or more of derris or cube (0.5 percent or more of actual rotenone) can be relied upon for control of all species of cattle lice. Finely ground sabadilla seed can substitute for rotenone. The sabadilla, diluted 1 part to 10 parts of wettable sulfur will suffice, if used at the rate of 3 ozs. or more per animal.

Other products mentioned in the report included "Lethane 60," "Lethane B71," "Thanite," "Phenothioxin," "Dow K 1875" and pyrethrum, which "have considerable toxicity to cattle lice, but apparently cannot be relied upon for complete control." A combination of "Lethane B71" and nicotine seems to have promise for control of all species of cattle lice, but more work is necessary on this louse powder.

DDT is described as being "fairly high in toxicity to cattle lice, but does not seem to be as effective as rotenone or sabadilla in dusts." Spot dusting as a method of evaluating louse powders is not accurate, mainly because lice migrate too rapidly into the areas dusted, and this method gives no indication of residual action.

Survey of Insecticides

During the war, lead, arsenic, and fluorine compounds, derris, pyrethrum, and nicotine were relied on to control most of the injurious insects, and copper and sulfur compounds were the principal fungicides. The diversion of large quantities of inorganic insecticide components to war production, and reduced imports of pyrethrum and rotenone greatly intensified the need for new chemicals for fighting insect pests. Because inorganic compounds are more likely to present spray-residue problems and because of the potential industrial availability of a vast number of organic compounds, the search for new insecticides is among organic products. In the selection of compounds suitable for testing, the structures possessed by the highly effective naturally occurring insecticides have served as a pattern for some of the work with synthetic materials. In addition many compounds unrelated to the insecticides of natural origin were tested. Progress made in recent years in the chemical phases of economic entomology is presented. H. L. Haller, *Ind. Eng. Chem.* 39, 467-73 (1947).

•

Fertilizer Booklet Out

California Agricultural Experiment Station, Berkeley, has issued circular 367, "Fertilizers, Soil Analysis, and Plant Nutrition," by D. R. Hoagland, professor of plant nutrition and plant physiologist in the experiment station. The booklet emphasized "the extreme complexity of the conditions which govern the growth of crops," and proceeds into the chemical elements essential to plant growth, and the various processes used by plants in absorbing these nutrient elements. The availability of phosphorus and potassium is discussed, as is the use of nitrogen and other fertilizers, and the chemical effects of the soil on added fertilizers.

Other sections of the bulletin discuss covercrops and rotation of crops, use of animal manure, the role of organic matter, fertilization and quality of the crop and plant nutrition and the nutritional value of crops. Acid and alkaline soils are also discussed, along with methods of soil analysis and plant analysis for diagnosing soil deficiencies. The booklet contains 24 pages, and is available from the California experiment station.

•

Sulfur Sprays on Apples

Cornell University, Ithaca, N. Y., has published a report on the effects of sprays and lime sulfur and of elemental sulfur on apples, in relation to yield. The study covered a five year period (1933-37) on a McIntosh orchard in which individual tree yields were available for the three previous years during which time they have received a uniform lime-sulfur schedule. Effects of the various fungicides during the following season were termed as deviations in yield under a given treatment from this three-year average. It is pointed out that these deviations in yield expressed in bushels per tree are shown largely to eliminate the variance due to tree size and location.

"MIST" COVERAGE IS COMPLETE COVERAGE
Whatever your spray material whatever its purpose, the Aero Mist Sprayer will atomize it into a fine, effective mist.
The "LAWRENCE" is precision built, mounted on a "turret" base which revolves in a complet 360° circle.
For further information write
The LAWRENCE AERO-MIST SPRAYER CO.
Greenfield, Mass.

No DDT on Forage Crops

Use of DDT on forage crops is not recommended, since the material shows up in the meat, milk and butter of cows fed upon crops dusted with the insecticide. According to Dr. P. N. Annand, chief of the Bureau of Entomology and Plant Quarantine, U.S.D.A., testifying May 23rd at House hearings on funds for the department, too much DDT may poison the soil and may permit some pests to increase because it kills the parasites which destroy them. Dr. Annand stated further that "DDT builds up in the meat, particularly in the fats, and where forage crops are fed that have a high DDT residue, the amount that accumulates in animal fat is rather astounding." The Bureau chief also explained that the toxicity of the DDT was not destroyed by cooking the meat over a fire, and he went on to say that there is more concern over secretion of DDT in milk because it concentrates in the butter fat, so that butter may have fairly high quantities.

•

Orange Worm Control

Of four species of worms feeding on oranges, *Tortrix* is most damaging, although *Pyroderces* is reported to be building up in numbers in Orange County, California, and is becoming of more importance. Control measures successful in control of Tortrix have not been fully adequate for Pyroderces. Applications recommended by the Bureau of Pest Control, California Growers Exchange are as follows:

Dusts — Approximately 90 pounds per acre of 50 percent cryolite dust, except where spider is also present. In the latter case, a combination "DN"-cryolite dust at the same dosage is recommended. In groves where rust mite control is also necessary, cryolite-sulfur dust at the same dosage is recommended.

Sprays—cryolite may be used with water at the rate of 3 pounds per 100 gallons. Thorough application should be made to assure best possible coverage of the fruit clusters.

Orange worms are most damaging in groves with clustered fruit and where there is an abundance of smut and dirt from aphis, mealybug, or black scale. Forecasting the damage to be caused by orange worm is said to be impossible, so it is recommended that groves with a past history of damage should be treated, especially if the crop is clustered.

•

Hexa-Tetra Digest

Bulletin E-721 of the Bureau of Entomology and Plant Quarantine, U.S.D.A., gives a digest of information on hexaethyl tetraphosphate. Prepared by Dr. R. C. Roark of the Division of Insecticide investigations, the bulletin summarizes the history of the material, describes its preparation and physical and chemical properties, and its effect on metals and plants. The material was formerly made by the I. G. Farbenindustrie at Leverkusen, Germany, the bulletin reports, under the name "Bladan." Undiluted hexaethyl tetraphosphate is stable at room temperature, the bulletin states, but is hydrolyzed readily when in contact with water, and the hydrolysis products have little or no insecticidal value. For this reason the warning is given to use the material immediately after dilution. The ester is almost completely hydrolyzed on standing in water for 24 hours, and the solution should be made up just before it is used as a spray. As to toxicity to mammals, the bulletin confirms previous findings that the ester is very toxic to man, and must be handled with care in bulk.

Insecticidal value of the material, determined by tests at Beltsville, Md., showed "no significant difference in toxicity to insects between hexaethyl tetraphosphate made by the Schrader process and that made by the Woodstock process, or between commercially prepared material and that prepared in the laboratory. The influence of the type of formulation of hexaethyl tetraphosphate on its insecticidal effectiveness has not been gone into by experimenters and should be carefully tested. Commercial formulations now on the market are made up with 50 percent of the ester. All concentrations of insecticide mentioned in this digest have been converted to those of the hexaethyl tetraphosphate and not of the formulation, and all aqueous solutions were tested immediately after their preparation."

•

"1068" Undergoes Tests

Results of tests conducted during 1946 by privately sponsored research fellowships on "1068," (Chlordane) manufactured by Velsicol Corp., Chicago, indicate that the insecticide is highly effective for the control of grasshoppers, cotton insects, cabbage insects, lygus bugs and ants. In the case of grasshoppers, the results of "1068" were particularly outstanding, it is reported. Formulated as a 2 percent oil solution, the material is found to be effective in the control of roaches, bedbugs, houseflies and other agricultural, household, and industrial insect pests.

•

Bromo Analog Of DDT

The Colorado Agricultural Experiment Station, at Fort Collins, has been experimenting with 2,2-bis (*p*-bromophenyl)-1, 1,1-trichloroethane, an analog of DDT which the Station calls Colorado 9.

Like DDT, it is stable, not unpleasant in odor, and lethal to many insects. Among the insects controlled are flies, potato and tomato psyllids, tuber flea beetles, and leaf hoppers.

DDT, when used on leguminous plants at high concentrations, has a definite depressing effect on the bacterial nodules. In agricultural crop rotation, where legumes are grown to increase soil nitrogen, DDT is therefore at a serious disadvantage. It is most significant that Colorado 9 has no such depressing effect, permitting its use on legumes without disturbing the nitrogen-fixing mechanism.

•

Temperature Affects DDT

Experiments recently made in Canada with DDT, showed definitely that the mortality by both contact and stomach action of DDT steadily decreased as the temperature rose within the range tested between 60° and 95° F. It was noted that this held true for stomach poisoning even when considerably more of the treated foliage was consumed at the higher temperature than at the lower.

Persistence of DDT Deposits

A study of the persistence of DDT deposits from kerosene sprays on citrus leaves and fruit is reported as affected by (1) degree of purity of DDT, (2) use of certain auxiliary solvents, (3) addition to the spray mixture of a gelling agent, (4) rate of DDT evaporation, (5) rate of DDT reissuance from plant tissue, and (6) weathering and decomposition of DDT over a 3-month period as determined chemically and biologically. The experiments were made during the hottest period of the year to accentuate any high-temperature effects on DDT residue.

Deposits from sprays containing kerosene and DDT showed an increase of DDT 24 hours after application, to 40 per cent over the original deposits. Deposits from sprays containing also "Velsicol AR 60" showed a decrease of DDT up to 25 per cent within 24 hours. After these initial changes, all DDT deposits decreased steadily at approximately 0.25 gamma per square centimeter of leaf surface per day for 85 days. Evidently when kerosene-DDT spray is applied, much of it penetrates the leaf tissues almost immediately and carries the DDT with it. During the next 24 hours the kerosene and DDT reissue from the leaf to its surface. The kerosene then evaporates, leaving a deposit of DDT.

Addition of aluminum stearate largely prevented the initial penetration of spray, and gave greater initial DDT deposits. However, in 24 hours the surface deposits from sprays containing aluminum stearate were nearly the same as those from sprays without this compound. Sprays containing tetralin as auxiliary solvent had little effect on the persistence of DDT deposits. Two heavy rains did not appear to affect the magnitude of DDT deposits. After 86 days, all treatments lost 71-95 per cent of the original amount of DDT deposited. The greatest losses occurred in sprays containing aluminum stearate regardless of the presence of an auxiliary solvent. F. A. Gunther, D. L. Lindgren, M. I. Elliot, and J. P. LaDue. J. Econ. Entomol. 39, 624-7 (1946).

Curly-Top Disease

The extension department of the Washington State Agricultural Experiment Station, Pullman, Washington, describes Curly-Top disease of vegetable crops in its recent bulletin No. 357. The disease is described as a virus causing extensive losses to crops in various parts of Washington. Plants affected include tomato, beans, squash, pumpkin, beets, chard, spinach, pepper, cucumbers and muskmelon. The virus is carried by the beet leafhopper, a migrating insect which leaves its natural breeding grounds when spring vegetation dries, and moves with prevailing winds. If these winds continue for several days the insects may travel long distances.

All varieties of tomatoes except certain small, wild kinds bearing green fruit, are susceptible to the disease. Control methods include sowing seed directly on the field, providing as much shade as possible, and by late setting in the field. The symptoms of the disease and recommendations for its control are also given for other plants subject to curly-top.

Free Flowing
NON-ABRASIVE
CLAYS
Ground to specifications especially for
AGRICULTURAL DUSTS
For years, our soft clays have been successfully used as diluents. Fans—nozzles—tubes of dusting machines just don't wear out because there is NO ABRASIVE ACTION WITH OUR CLAYS—they can be used with absolute safety.
Prompt Shipments Assured This Season
UNITED CLAY MINES
CORPORATION
TRENTON NEW JERSEY

INDUSTRY NEWS

Plant Food Council Meets

The annual convention of the American Plant Food Council was to be held June 13, 14 and 15 at the Homestead Hotel, Hot Springs, Va. Secretary of Agriculture, Clinton P. Anderson headlined the roster of speakers at the three-day gathering. His talk was scheduled to be the climax of the convention, at the banquet Sunday evening. Other speakers on the program included Dr. Firman E. Bear, chairman of the Soils Department, Agricultural Experiment Station, New Brunswick, N. J.; Rep. Harold D. Cooley (D-N. C.), member of the House Agricultural Committee; and Prof. Emil Truog, Chairman of the Soils Department of the University of Wisconsin, Madison. An "Agricultural Editors' Breakfast Forum" was held on the morning of June 14, under the chairmanship of Dr. Paul D. Sanders, editor of "The Southern Planter," Richmond, Va. Speakers at this session included Robert H. Reed, editor of "Country Gentleman," Philadelphia; Ray Yarnell, editor of "Capper's Farmer," Topeka, Kansas; and W. C. Lassetter, vice-president and editor of "The Progressive Farmer," Memphis, Tenn.

Representatives of the 4-H Clubs, and the Future Farmers of America were present at the convention discussing the general theme of "Youth in Agriculture."

•

London Chemistry Conference

The eleventh International Congress of Pure and Applied Chemistry is scheduled to be held in London, England, July 17 to 24. Chemistry in relation to agriculture and applied botany is one of the sections of the program which includes also a dozen other sections ranging in scope from inorganic geo-chemistry to chemical engineering.

Five sessions are scheduled in connection with the section on chemistry in agriculture. These are: soil fertility, plant nutrition, animal nutrition, milk and dairy products, insecticides and fungicides.

As originally planned following the tenth international congress in Rome in 1938, the London meeting was to be held in 1941. The war of course interrupted this schedule, and next month's meeting is the first to be held since that time.

•

N.F.A. Meets June 19, 20, 21

Although last-minute details had not been completed early in June, plans for the annual convention of the National Fertilizer Association were moving ahead with the addition of Dr. G. Scott Robertson to the list of scheduled speakers. Dr. Robertson is Director of the Division of Agriculture, Food and Agricultural Organization of the United Nations. During the war he directed agricultural operations in parts of Europe. Although his subject had not been announced early in the month, he is expected to touch on the international aspect of the fertilizer situation. Other speakers scheduled to appear on the program, in addition to Dr. Robertson, include Weller Noble of the Pacific Guano Co., Berkeley, California; Dr. W. H. Martin, Dean of the New Jersey Agricultural Experiment Station, New Brunswick, N. J.; Glenn A. Cumings, U. S. Department of Agriculture, Washington, D. C.; Dr. Jackson B. Hester, soil technologist, Campbell Soup Co.; and Professor C. J. Chapman of the Department of Soils, University of Wisconsin, Madison.

The convention, scheduled to be held June 19, 20 and 21, will have its headquarters at the Essex and Sussex Hotel, Spring Lake, N. J. The first day of the convention will be devoted to a meeting of the N.F.A. Board of Directors, and various committee meetings, while the remaining two days will be occupied by the general sessions of the convention. The annual N.F.A. banquet will be held on the evening of June 20.

•

Coming Meetings

Agricultural Chemicals wishes to publish the meeting date and place of any gathering concerned with manufacturing, distribution, application or discussion of chemicals for agricultural use. Information of such meetings is solicited.

American Association of Economic Entomologists (Pacific Slope Branch) June 23, 24, 25, Berkeley, Calif.

Fertilizer Chemistry Division, A.C.S., Sept. 14, New York.

Pacific Chemical Exposition October 21-25, San Francisco.)

American Association of Economic Entomologists (In conjunction with meeting of American Association for Advancement of Science, December 26-31, Congress Hotel, Chicago, Ill.

Exposition of Chemical Industries New York, December, 1947.

23rd Annual meeting, National Shade Tree Conference, Cleveland, Ohio, August 18-22

International Congress of Pure and Applied Chemistry, London, July 17 to 24.

•

Sterling to Mfg. Insecticides

Sterling Chemicals, Inc., has recently acquired the insecticide and Resin Division of Ansbacher-Siegle Corporation, Brooklyn, N. Y. The plant is now in the process of being moved to Newark, N. J., where new facilities are under construction, and part of the plant formerly occupied by the United Color and Pigment Division of Calco Corp. is being renovated and adapted for use by Sterling. The new firm will manufacture agricultural spray materials and synthetic resins. B. R. Armour is president and treasurer of the new company, William Steinschneider is vice-president, and R. J. Fitzmaurice is secretary.

New Dow Insecticide

"Dowklor" is the name of a new chlordane insecticide being placed on the market by Dow Chemical Co., Midland, Michigan. The new product is available in three compositions, according to F. W. Fletcher, Dow entomologist. One available formulation of "Dowklor," containing 50 percent actual chlordane by weight, can be used as a dust concentrate or as a wettable powder for a water spray. This concentration is reported to be effective against agricultural pests such as grasshoppers, squash bugs, Lygus bugs, chinch bugs, aphids, Colorado potato beetles, and various cotton insects. Other formulations are designed for use as household and industrial insecticides. "Dowklor" is available to pest control operators and to jobbers, according to the company.

•

Virginia-Carolina Builds

Construction on increased plant facilities of the Virginia-Carolina Chemical Corporation's chemical division units at Charleston, South Carolina began last month, according to an announcement by the company. The plant manufactures phosphoric acid, inorganic phosphates and related products.

•

Fungicidal Bomb Marketed

"Fung-I-Vapor," a new five-pound refillable aerosol bomb has been put on the market by the Edco Corporation, Newark, Del. The new bomb, distributed by Innis, Speiden & Co., New York, contains benzyl salicylate and cottonseed oil. The propellant is "Freon-12." The fungicide is for control of blue mold in tobacco seedbeds, and one-half pound is sufficient coverage for 100 square yards for small plants, the manufacturer states. For larger plants, a slightly heavier dosage is required. According to the makers, practically 100 percent control of blue mold (*Personospera tabacina*) can be expected from proper application of the material. Full information is available from either Edco Corp. or Innis, Speiden & Co.

Pacific Exposition for Oct.

Recent developments in the insecticide field will be included in a series of conferences to run concurrently with the Pacific Chemical Exposition in San Francisco, next Oct. 21 to 25. In charge of this phase of the program will be the Pacific Insecticide Institute, it was announced by Dr. Robert Matteson, chairman of the California section of the American Chemical Society, which is sponsoring the exposition. Nine other organized groups are also arranging for similar one and two-day conferences for presenting new developments affecting application of chemical knowledge.

•

Chemical Exposition for 1947

Plans are taking shape for the 21st Exposition of Chemical Industries to be held in New York in December, 1947, according to International Exposition Co., in charge of arrangements. Four floors of the Grand Central Palace will be occupied by the exposition.

For a Better Insecticide Business

Investigate the

McLAUGHLIN GORMLEY KING

FRANCHISE PLAN

If the manufacture and sale of agricultural insecticides would fit in naturally with your present business . . . If you are a reliable, progressive and alert company . . . If you are interested in making a permanent and profitable addition to your present lines . . . Send for full information about The M. G. K. Franchise Plan featuring the nationally advertised Pyrocide* Dust and Multicide* (DDT) Dusts and Sprays.

McLaughlin Gormley King Co.
Minneapolis, Minnesota ☆ ☆

*Name*_____

*Address*_____

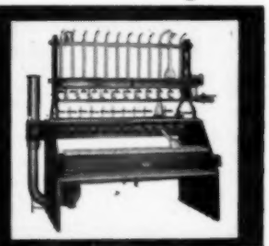
*City*_____ *State*_____

*TRADE MARKS REG. U. S. PAT. OFF.

Specify

"PRECISION" KJELDAHL

FOR FLEXIBILITY, EFFICIENCY, AND TROUBLE-FREE OPERATION



MULTI-HOOD FUME EXHAUST does not employ protruding nipples. System consists of a horizontal fume exhaust manifold, vertical self draining stack with built-in Venturi ejector, and powerful motor blower. Tellurium lead used throughout stack and manifold.

VENTURI ASPIRATOR draws fumes from manifold, thoroughly condenses and mixes the fumes with water, ejects diluted acid to drain.

SEAMLESS COPPER MANIFOLDS. Rigid and durable, each manifold is a single length of tubing; with no couplings or joints.

SEAMLESS COPPER CONDENSER JACKETS. Outside diameter 1". High ratio of condenser surface to water mass. High flow-velocity promotes condensing efficiency. No stagnant water pockets. Jacket brazed-in. Assembly is absolutely leak proof.

BLOCK TIN TUBES. Tin condenser tubes are 3/8" I. D., 1/16" wall, pure block tin, not a tin coated base metal.

REINFORCEMENT. Condenser tubes protected by brass sleeves at top and bottom where tubes protrude through the manifolds.

SELF-SEALING PACKING. Prevents leaks, renders joints positively watertight. Compresses against reinforcing sleeve - does not constrict condenser tube.

LEAK-PROOF STUFFING BOXES at upper and lower manifolds where condenser tubes protrude. Cleanout caps located at each end of upper and lower manifolds.

Each unit of Multi-Tube distillation comprises an individual condenser, with block tin tube, reversible porcelain retractory for 500 ml. or 800 ml. Kjeldahl flasks, Gas burner or electric heater, and receiver pan. Cooling water forced through condenser system, under pressure enters intake manifold at one or more points, depending upon number of units in assembly. Pressure circulation eliminates air pockets, insures uniform condensation for simultaneous completion of all distillations. Write for detailed Kjeldahl literature 515-O.

See Your Laboratory Supply Dealer

Precision Scientific Company

3737 CORTLAND STREET CHICAGO 47, ILL., U.S.A.

Scientific Research and Production Control Equipment

Fertilizer Output Praised

IN its annual report on fertilizer consumption in the U. S., the National Fertilizer Association states that approximately 14,900,000 tons were used in 1946, representing an increase of 1,700,000 tons, or 13 percent above 1945, the previous all-time peak.

Maurice H. Lockwood, president of the N.F.A. stated that with production more than doubled since the pre-war period, fertilizer manufacturers are meeting the greatly increased demands of agriculture. This fact, he remarked, "is the industry's answer to its critics . . . New plants are being constructed in all parts of the country where demands indicate the need, and we look forward to an even greater production in 1947 than in 1946," he said.

In making public its 1946 compilation, the NFA gave the following reasons for the substantial increase in fertilizer use during the last several years: (1) The educational program carried on by the fertilizer industry, the USDA, and the state colleges of agriculture and their extension services; (2) A shift in crop production due in part to a change in the American diet; (3) The comparatively rapid growth in fertilizer use in the newer agricultural regions of the West; (4) The ability of the commerial plant-food industry to supply increased quantities of improved fertilizer.

•

New DDT Plant in West

Manufacture and distribution of DDT on the west coast is announced by Montrose Chemical Corporation which has begun production of the material on a large scale at its plant at Torrance, California. Distribution of DDT in the west will be handled by Stauffer Chemical Co. through its offices at Los Angeles, San Francisco, and North Portland, Oregon. The company hopes to simplify the supply and distribution of DDT in the west through this innovation, since heretofore most of the material had been manufactured in the eastern part of the U. S.

Tobacco By-Products & Chemical Corp., Louisville, Ky., is marketing its "Black Leaf Mosquito-Fumer" in a limited area along the eastern seaboard. The product, containing 14 percent DDT and .5 percent nicotine expressed as alkaloid, is expelled by pressure generated when "window" in top of container is melted by lighter which is part of the package. The Mosquito-fumer was worked out through the cooperation of Tobacco By-Products Corp. and the New Jersey Agricultural Experiment Station.

•

G. W. Sheridan Dies

George W. Sheridan, for more than 60 years an employee of the American Agricultural Co., New York, died May 13 at his home in Carteret, N. J. Mr. Sheridan, 88, had retired some six years ago.

•

Hooker Produces New Acid

Hooker Electrochemical Co., Niagara Falls, N. Y., announced in May production of monochloracetic acid on a commercial scale. The acid is an intermediate in the manufacture of carboxymethyl cellulose (CMC), ammonium thioglycollate, and thioglycollic acid as well as for the weed killer, 2,4-D and esters of *alpha*-napthlene acetic acid, used for fruit set and tuber storage control. The Hooker acid is a white crystalline material with a strong sweetish odor. It is corrosive to the skin. Although the plant is beginning large scale production, all of its output for some time to come is already taken. Further announcement is expected to be made by the company when the product is available generally. The material will be sold in two grades: high grade and technical grade.

Opens Portland Office

Wilson & Geo. Meyer & Co., agricultural and industrial chemicals sales organization, announce the establishment of new offices at 520 S. W. Sixth Ave., Portland, Oregon. The new location, set up to supplement offices at Los Angeles and San Francisco, Calif., will serve the northwest. In charge of the new branch is John A. Foster, formerly of the Seattle office. Among the firms represented by Wilson & Geo. Meyer & Co., are American Potash and Chemical Corp.; Tennessee Eastman Corp.; Consolidated Chemical Industries, Inc.; Stauffer Chemical Co.; Mountain Copper Co.; Western Peat Co., Ltd.; and McLaughlin Gormley King Co.

•

Nitrate Investigation

The recent Texas City, Tex., disaster resulting from explosion of a shipload of ammonium nitrate has prompted the launching of an investigation by Underwriters Laboratories, in Chicago, to find answers to problems related to fire and explosion hazards of this fertilizer element.

The project is sponsored by the National Board of Fire Underwriters, whose general manager, W. E. Mallalieu, said that the Chicago research laboratories will seek the cooperation of any other organizations that may be of assistance in the work.

Alvah Small, president of Underwriters Laboratories, in outlining the new project, said two somewhat related research projects have been handled in the laboratory previously.

"In neither of these reports," he said, "is there any account of exploration of ammonium nitrate per se, with respect to the possibility of detonation from fire exposure."

•

Carbide & Carbon Moves

Carbide & Carbon Chemicals Corp. announces that its Los Angeles district office is at a new address, 416 W. 8th St., L.A. 14. The company is the chemical producing unit of Union Carbide and Carbon Corp.

Freeport Expands Facilities

A new subsidiary to be known as The Micronizer Company, has been formed by Freeport Sulphur Co., New York, according to an announcement by L. M. Williams, Jr., president of Freeport. The new subsidiary in turn has purchased the assets of International Pulverizing Corporation, Micronizer Processing Company, Inc., and Micronized Products, Inc. Plants will be operated at Moorestown, N. J., and Charlotte, Mich. Maurice F. Dufor, vice-president and general manager of the Micronizer Comany, is in charge of operations. His headquarters are at Moorestown. The subsidiary plant and its affiliates will grind sulfur for agricultural use, and will reduce organic insecticides such as DDT.

•

Dr. W. H. Ross Dies

Dr. William H. Ross, retired Principal Chemist of the Division of Soils, Fertilizers and Irrigation, Bureau of Plant Industry, U.S.D.A., died in Washington, May 16. Dr. Ross was an authority on the chemistry of fertilizer phosphates. Among his achievements in this field were the ammoniation of superphosphate, the granulation of fertilizers and fertilizer materials, moisture determination, boron toxicity, and conditioning of fertilizers and fertilizer materials. He had been with the U.S.D.A. for 34 years, and retired last year. Since then he had kept in touch with his old Division of the U.S.D.A., and had been a consultant for the National Fertilizer Association. He was a captain in World War I, and was buried in Arlington National Cemetery.

•

Bag-Filler Demand Grows

St. Regis Paper Co., New York, announces that its valve bag-filling machine designated "100-LS" is now in wide use in the fertilizer field as well as in other industries, and that more than 100 units are now in use. The machine, designed to meet the demand for an inexpensive filling method with advantages of mechanized industrial packaging equipment, came on the market in 1944. The company states that more than 30 machines are now on order. Features of the bag filler include labor-saving devices such as automatic bag-closing, and adaptability to other mechanical devices used in connection with the filling process.

•

Wisconsin Biennial Report

The Biennial Report of the Wisconsin Department of Agriculture (bulletin No. 274) describes in detail the efforts of the state to control insects, plant disease, and weeds in agricultural areas. The report stated that plant diseases alone cause an annual loss in the state in excess of $100,000,000, and that weeds take a toll almost as great. The book describes the working of the state's nursery inspection laws, designed to prevent the introduction and spread of insect pests and plant disease. Quarantine provisions are enforced in Wisconsin, the report says, par-

MISTMASTER — for Spraying

Insecticides including DDT

DISINFECTANTS, no matter how deadly, must be properly sprayed. They reach all crevices, cracks, out-of-the-way places with the power of MISTMASTER. It sprays liquid insecticides up to forty feet.

Equipped with 1/3 or 1 h.p. G.E. motor, a 1 gallon tank and plug-in cord, MISTMASTER is ready for fast, effective spraying over wide areas. Compressor type also available for suspension mist type spraying. *Request complete details*

Sprayer Corp. of America 1710 Payne St. Evanston, Ill.

WEEDANOL

FOR

WEED CONTROL

WEEDS mean LOSS wherever they grow! Wipe them out AT LOW COST with **WEEDANOL**, the 2,4-D Weed Killer that " strikes at the roots" of the weed problem.

DEALERS — SUPPLIERS OF AGRICULTURAL PRODUCTS—CUSTOM SPRAYERS— FORMULATORS

REMEMBER:

"It is an advantage of 2,4-D that treatment can be applied at less cost—and with less interruption to the productive use of the land—than with any other chemical weed killer now in wide use."

WEEDANOL concentrates are available in the approved

40% Amine Salt of 2,4-D
70% Sodium Salt of 2,4-D
Pure Acid form of 2,4-D

For prices and further information write

ASSOCIATED CHEMISTS, INC.
North Collins **New York**

ticularly to protect the state's elm trees from Dutch elm and *Phloem Necrosis,* diseases now affecting trees in neighboring states. Precautions are being observed by the entomology department against infestations of many insects, including those affecting cranberries, potatoes, corn, and other crops important in the state. The major insect threat to the corn crop is the European corn borer which has been present in Wisconsin for the past 15 years. In some fields, the report says, the normal weight of ear corn was reduced as much as 30 percent because of the infestation.

Use of fertilizers have increased greatly within the past few seasons in Wisconsin, according to a chart presented in the report. In ten year periods, the record shows the rate of increase: in 1916, 5,000 tons were consumed; in 1926, 16,000 tons; in 1936, 32,184 tons, and in 1946, 280,000 (the latter figure estimated). It was pointed out that "during the past few years, the total consumption figures are more of an indication of availability than of actual satisfaction of demand. Fertilizer production, while reaching a record total . . . was inadequate to meet the demand . . ."

•

Western DDT Plant Grows

Pennsylvania Salt Co., Philadelphia, announces that its technical DDT plant being built near Portland, Oregon, is more than 60 percent completed. This plant is one of the first DDT units to be constructed in this area. Production will be used to supply agricultural users in eleven western states, according to Fred C. Shaneman, president of the company.

•

Cattle Spray Program

The National Livestock Loss Prevention Board, Kansas City, has announced a cooperative plan to test control methods on the hornfly during the month of June. According to the preliminary schedule, experiments were to be made on cattle herds at a number of farms in Kansas and Missouri. Groups cooperating in the tests include the U.S.D.A. Bureau of Entomology and Plant Quarantine, the Extension Divisions of Kansas and Missouri, the Kansas State Livestock Sanitary Commissioner, the State Veterinarian of Missouri and the National Live Stock Loss Prevention Board. It was planned to spray the animals with 0.50 percent concentrations of active ingredients of four of the new insecticides in comparison with DDT wettable powder.

•

State Sprays Cities, Farms

IN an effort to rid its cattle herds of insect infestations, the state of Oklahoma has taken definite strides in this direction. During 1946, the state treated more than 1,600,000 cattle for control of flies, lice, ticks and grubs, using DDT for summer spray work, and rotenone in the winter. In addition to the animals sprayed, the project also included the spraying of 10,000,000 square feet of barn space and 61 towns and cities.

Cattlemen are reported to be enthusiastic over the results of spraying. Murray Cox, Stephens County farm agent stated that spraying cattle for control of lice at 15c per head will do more good than any $5 investment in feed. Towns and cities are also boosters for the program which is provided by the state at cost.

The spray program was initiated last year under the direction of J. C. Scott, president of the Oklahoma State Board of Agriculture. A fleet of 86 large army decontaminator units was secured for the state service, in addition to some 30 army ambulances equipped with smaller spray units. This equipment was sufficient to service the state's 77 counties, allowing for extra units in counties where the livestock population is greatest. The trucks are also being used to some extent for orchard spray work and weed control experiments, particularly in bind weed areas.

Clyde Bower, head of the entomology division of Oklahoma department of agriculture, in commenting on the service, stated that where DDT spray was used for fly control on herds at regular intervals in summer and fall, the louse infestation was light in the winter. DDT at 0.2 percent solution was used in the fly spray, and a 0.6 percent solution was used for tick control in the southeastern part of the state. Mr. Bower is now recommending the use of rotenone for grub control only, although rotenone-DDT mixtures were used last year in winter spray work.

•

Co-op's Sales Reports

Substantial increases in dollar value of sales of fertilizers and insecticides distributed by the eighteen largest farm supply cooperatives is indicated in a Farm Credit Administration study of their operations covering 1944 and 1945. Combined fertilizer sales of the eighteen co-ops, which totalled $23,976,170 in 1944, increased 10.6 percent to $26,527,323 in 1945, the report shows. Insecticide sales, which amounted to $3,824,374 in 1944, were $4,165,667 in 1945, an increase of 8.9 percent.

Largest distributor of insecticides was Fruit Growers Supply Co., Los Angeles, Calif., whose sales to 12,000 "Sunsweet" citrus fruit growers in 1945 amounted to $1,404,643, this being a small increase over the $1,122,901 figure for 1944.

Figures in the report covering G. L. F. Exchange, Ithaca, N. Y., largest farm supply co-op serving American farmers, lump 1945 sales of insecticides with those for "sprays, soda and washing powder, shells, bedding, etc.," for a total of $1,396,984, which was a decrease from the comparable figure of $1,427,758 in 1944. Fertilizer and lime sales of G. L. F. increased from $5,271,872 in 1944 to $6,024,765 in 1945. This cooperative operates 9 fertilizer and insecticide plants, the report states.

Southern States Cooperative, Richmond, Va., increased sales of fertilizer from $5,922,237 in 1944 to $6,795,594 in 1945 but the report carries no figures on insecticide sales, if any. Eastern States Farmers Exchange, West Springfield, Mass., showed a drop in sales of insecticides from $307,135 in 1944 to $283,531 the following year, while fertilizer sales increased by $93,865 to $2,599,173 in 1945. Insecticide sales of Consumers Cooperative Association, Kansas City, Mo., dropped about $2,000 in 1945 from the previous year's figure, and Illinois Farm Supply Co., Chicago, also showed decreased insecticide sales.

Associated In Service To The American Farmer

More than 80 percent of the insecticides, fungicides and related chemicals used in the nation's agriculture are supplied by these AIF supporters:

Acme White Lead & Color Works, Detroit.
Agicide Laboratories, Inc., Racine, Wis.
Agricultural Supply Co., Grand Forks, N. D.
The American Agricultural Chemical Co., New York.
American Cyanamid Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Atlas Powder Co., Wilmington, Del.
J. T. Baker Chemical Co., Phillipsburg, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Brooklyne Chemical Co., Baltimore, Md.
California Spray-Chemical Corp., Richmond, Calif.
Carbide & Carbon Chemicals Corp., New York.
Carbola Chemical Co., Inc., Natural Bridge, N. Y.
Central Chemical Corp., Hagerstown, Md.
Chipman Chemical Co., Inc., Bound Brook, N. J.
Colloidal Products Corp., San Francisco.
Commercial Chemical Co., Memphis, Tenn.
Commercial Solvents Corp., New York.
Cooperative GLF Soil Building Service, Inc., New York.
Cooperative Seed & Farm Supply Service, Inc., Baltimore.
Crop Saver Chemical Co., Inc., Chicago.
Derris, Inc., New York.
Dodge & Olcott, Inc., New York.
The Dow Chemical Co., Midland, Mich.
E. I. duPont de Nemours & Co., Inc., Wilmington.
Farm Bureau Services, Inc., Lansing, Mich.
Florida Agricultural Supply Co., Orlando.
Geigy Co., Inc., New York.
Hammond Paint & Chemical Co., Beacon, N. Y.
Hercules Powder Co., Wilmington, Del.
Irvington Smelting & Refining Works, Irvington, N. J.
Julius Hyman & Co., Inc., Denver.
The Kilgore Seed Co., West Palm Beach.
Kenneth Kluherz, Inc., Torrington, Wyo.
Leffingwell Service Co., Ltd., Whittier, Calif.
Long Island Produce & Fertilizer Co., Inc., Riverhead.
Los Angeles Chemical Co., Los Angeles.
Lucas Kil-Tone Division, John Lucas & Co., Inc., Phila.
Martin-Smith Co., San Antonio.
McConnon & Co., Winona, Minn.
McCormick & Co., Inc., Baltimore.
McLaughlin Gormley King Co., Minneapolis.
Merck & Co., Inc., Rahway, N. J.
Michigan Chemical Corp., St. Louis, Mich.
The Michigan Fertilizer Co., Lansing.
Miller Chemical & Fertilizer Corp., Baltimore.
Miller Products Co., Portland, Ore.
Monsanto Chemical Co., St. Louis.
Niagara Sprayer & Chemical Division, Food Machinery Corp., Middleport, N. Y.
Nico-Dust Manufacturing Co., Los Angeles.
Orbis Products Corp., New York.
Pacific Supply Cooperative, Portland, Ore.
S. B. Penick & Co., New York.
Pennsylvania Farm Bureau Cooperative Assn., Harrisburg.
Pennsylvania Salt Manufacturing Co., Philadelphia.
Phelps-Dodge Refining Corp., New York.
John Powell & Co., Inc., New York.
B. G. Pratt Co., Hackensack, N. J.
R. J. Prentiss & Co., Inc., New York.
R. J. Reynolds Tobacco Co., Winston-Salem, N. C.
The Rogers & Hubbard Co., Portland, Conn.
Rohm & Haas Co., Philadelphia.
San Francisco Sulphur Co., San Francisco.
The Sherwin-Williams Co., Cleveland.
Southern Acid & Sulphur Co., Inc., St. Louis.
Southern Agricultural Insecticides, Palmetto, Fla., and Hendersonville, N. C.
Standard Agricultural Chemicals, Inc., Hoboken, N. J.
Stauffer Chemical Co., New York.
Sunland Industries, Inc., Fresno, Calif.
Taylor Chemical Works, Ltd., Aberdeen, N. C.
Tennessee Corp., Atlanta, Ga.
Tobacco By-Products & Chemical Corp., Louisville.
United Cooperatives, Inc., Philadelphia.
United States Rubber Co., New York.
Velsicol Corp., Chicago.
Virginia Smelting Co., West Norfolk.
The J. R. Watkins Co., Winona, Minn.
Westvaco Chlorine Products Corp, New York.
Wheeler, Reynolds & Stauffer, San Francisco.
Woolfolk Chemical Works, Ltd., Fort Valley, Ga.

NEW MEMBERS SINCE LAST AUGUST:

Bridgeport Brass Co., Bridgeport, Conn.
Julius Hyman & Co., Inc., Denver.
Martin-Smith Co., San Antonio.
Michigan Chemical Corp., St. Louis, Mich.
United Cooperatives, Inc., Philadelphia.
Virginia Smelting Co., West Norfolk.
Westvaco Chlorine Products Corp., New York.

CO-OPERATION · A.I.F. ASSOCIATION · INTEGRITY · FAIRNESS

Agricultural Insecticide & Fungicide Association

285 Madison Ave. New York 17, N. Y.

COLLOIDAL DDT

(*Continued from Page 23*)

order to accentuate insecticidal differences. The fungicides were applied at the rate of 2.5 lbs. metallic copper per 100 gallons of water.

Applications were made with a power-driven 300 gallon capacity sprayer equipped with a 6-row boom to approximately 6 acres of Cobbler potatoes. Each material was applied at weekly intervals to 6-row plots 730 ft. long, at 100 gallons per acre.

Insect counts were recorded two days after treatments by taking sixteen 180 degree sweeps in each replicate. Counts were taken of flea beetles *Epitrix cucumeris* (Harr.) and potato leafhoppers *Empoasca fabae* (Harr.) from all treated plots. Data on maturity date, potato yield and general vitality of the plants were also recorded. Insect counts and yield obtained are summarized in Table 1, page 22.

These results showed that the emulsifiable DDT was the most effective preparation, followed by wettable DDT and colloidal DDT. The same order in rank of effectiveness was maintained for these materials when applied either with Bordeaux or tribasic copper sulfate. The effectiveness of the emulsifiable DDT may have been due in part to the presence of "Velsicol AR60" which enhances the toxicity of DDT as a contact insecticide. Except for the DDT emulsion sprays, Bordeaux tended, more than the tribasic copper sulfate, to decrease the insecticidal efficiency of the various DDT formulations. All DDT plots gave lower insect counts and higher yield than the check plot which was treated with Bordeaux only.

There was very little difference in the appearance of the plants in the various plots during the growing season, but at maturity on August 2, the check plots were dead or dying, whereas the colloidal and wettable powder plots were yellowing and the emulsion DDT plots were green. There was no visible difference in the maturity dates between plants treated with Bordeaux and tribasic copper sulfate.

The residual insecticidal properties of these formulations were also studied. Spray treatments were made on June 13 and counts of insects were recorded on June 15 and on June 21. The tests were replicated twice. Data showed that the emulsifiable DDT with Bordeaux tribasic copper sulfate gave the greatest initial and residual kill during the 8-day period. Wettable DDT powder gave good initial and residual control. Colloidal DDT gave excellent initial control of leafhoppers and flea beetles. Residual control was rather poor, especially for the flea beetles, populations of which built up until they approached or surpassed those in the check plots. Results are presented in Table 2.

A further test on the residual value of colloidal DDT was made by increasing the amount of DDT in 10-10-100 Bordeaux to 1 lb. A 50 percent pulverized wettable DDT was employed in Bordeaux at the rate of 2 lbs. per 100 gallons of water. The sprays were applied to a four acre field of Katahdin potatoes. (Results shown in Table 3).

Accumulated data indicate that colloidal DDT decomposes more rapidly than DDT in other formulations. It appears to have no toxic value after weathering for 7 days under field conditions. In laboratory tests, deposits of colloidal DDT sprayed at the rate of 1 lb. of DDT per 100 gallons of water, lost most of its toxicity to houseflies after 48 hours of exposure to ultra-violet light. DDT deposits from other formulations, however, proved moderately toxic after such exposure to light. Because of this fact, colloidal DDT may prove useful on crops where DDT residues may be objectionable or on those crops where residual toxicity is unimportant. It should be pointed out that although emulsion DDT gave satisfactory control of insects on potatoes, it should be used with caution on other crops since it tends to be phytotoxic.

Fly Control

PRELIMINARY studies with colloidal DDT on limed surfaces such as occur in dairy barns indicated that this material has suitable physical properties for fly control. Unlike wettable powders, collodial DDT may be applied at the recommended 5 per cent strength without clogging spray nozzles, since the particles are relatively small in size and leave little visible spray deposit. It may also be assumed that since this colloidal DDT is in a solid state, there is less opportunity for it to be absorbed by the

CHEMICAL MIXERS

END YOUR MIXING PROBLEMS, SPEED UP PRODUCTION WITH A SCOTTDEL CHEMICAL MIXER. THOROUGH AND SPEEDY MIXING ACTION. FEED FROM FLOOR LEVEL, FEED INTO HOPPER ABOVE THE FLOOR OR INTO THE TOP. USED FOR MIXING SEEDS, SOAP POWDERS OR DRY GRANULATED SUBSTANCES.

WRITE FOR LITERATURE

SCOTTDEL INC.

DEPT. "E"

SWANTON, OHIO

Copper Sulphate

Crystals
Superfine
Powdered

Monohydrated

Copper Sulphate

Manufactured by

Brooklyne Chemical Works, Inc.

Baltimore, Md.

Agricultural Sales Agents

W. R. E. ANDREWS SALES CO.

1505 Race Street, Philadelphia 2, Pa.

Since 1926

Agricultural Chemicals Specialists

---

memo

P.A.:

The trade says GRIFFIN'S

TREMS and TREX

are not only top-grade

emulsifiers and dispersing agents

but are price right, too.

Please check. The address is:

GRIFFIN CHEMICAL COMPANY
1000 - 16th Street
San Francisco, California

MOSQUITROL

will be one of the BIG selling items this season!

MOSQUITROL
KILL MOSQUITOES OUTDOORS
for Camps, Hotels, Clubs, Homes, etc.
MOSQUITROL
$1.75
1 lb. makes 12 gals. of spray
ENJOY your summer evenings in pleasant comfort. Sit on your porch or terrace, alongside flowers and shrubs, without the annoyance of mosquito and gnat bites. MOSQUITROL will not harm foliage.
If you want to act as distributor wire or write us at once.

In territories where sold last year results were phenomenal.

Nationally Advertised —

Better Homes & Gardens

Home Gardener

House Beautiful

Garden Gossip,

etc.,

during June, July & August

AMPION CORPORATION

4-87 47 AVE., LONG ISLAND CITY 1, N. Y.

skin. Furthermore, spraying this material does not create an objectionable odor such as characterizes the emulsifiable DDT concentrates.

In a laboratory test, a lime mixture was prepared with casein glue and hydrated lime[5] and applied to the interior surfaces of Petri dishes with a small brush. The dishes were coated five times in order to produce a lime deposit of approximately 1/8 inch in thickness. Each coating was allowed to dry thoroughly before the next coat was applied. The dishes were sprayed with DDT on a constant-speed turntable and were set aside at room temperatures for one week before testing. Five day old flies were placed in the dishes which were covered with clean plate glasses. Twenty to 30 flies were used per test and the 50 percent knockdown time was determined. Each test was replicated four times. Materials tested were: 50 percent micronized DDT wettable powder, 40 percent colloidal DDT Mixture No. 2, and 25 percent emulsifiable DDT concentrate. Results are presented in Fig. 3.

In residual toxicity, DDT wettable powder on lime ranked first, colloidal DDT second, and emulsifiable DDT decreased in efficiency as the concentration of DDT was decreased, the wettable powder lost little residual toxicity even at the lowest dilution. At concentrations of 5 and 2.5 percent, colloidal DDT and emulsifiable DDT were equally toxic but the former gave better knockdown rates at 1.25 and 0.625 percent DDT concentration. Since lime does not react chemically with DDT at room temperatures, the variation in toxicity of each formulation shows an interesting correlation between the physical nature of the spray deposits of the respective formulations. When solutions or emulsions of DDT are sprayed on absorptive lime surfaces, it appears that some of the DDT is carried into the lime with the liquid vehicle and thus removed from the treated surface. Most of the relatively large particles of DDT in the wettable powder, however, remain on the surface. Colloidal DDT being intermediate in size between wettable powder and emulsifiable DDT shows less residual toxicity on limed surfaces than wettable powder, but is more toxic than the emulsifiable DDT concentrate.

[5] Whitewash and Cold Water Paints Bulletin No. 304-E, Nat'l. Lime Assn., Washington, D. C.

Discussion

BECAUSE of certain physical properties, colloidal DDT may possess several advantages when used in insect control. The small particle size and absence of inert diluents result in little visible residue, an important factor in treating ornamentals and buildings. Where proper agitation is difficult, such as in cattle dipping tanks and hand sprayers, the small particle size and consequent slow setting rate of colloidal DDT would be advantageous. The apparent rapid decomposition of colloidal DDT on outdoor crops may simplify the residue problem on fruits and leafy vegetables. Since the material has little or no odor, it may be used in food packing plants where the odor of the common DDT emulsions or solutions would be objectionable. Colloidal DDT has been mentioned as being especially useful as a mosquito larvicide and other special uses may be developed with further field testing.

To summarize, the following results were noted:

1. Results of these studies show that colloidal dispersions differ in physical properties and insecticidal performance from other formulations of DDT now in general use.

2. The colloidal DDT dispersion is characterized by containing particles most of which measure approximately 1 micron in size and the remainder 30 microns in length and 2 to 3 microns in width.

3. In laboratory toxicity tests, the colloidal DDT was found to compare favorably with emulsifiable DDT and micronized DDT wettable powder and was more toxic than pulverized wettable powder.

4. In phytotoxicity tests, the colloidal DDT was safer than emulsions and compared favorably with wettable powders.

5. Field trials on potatoes indicate that the material gives good initial insect kill, but has poor residual qualities as compared to emulsions and wettable powders.

6. On limed surfaces, such as those found in dairy barns, colloidal DDT was intermediate in effectiveness between micronized wettable powders and DDT emulsions.

7. A brief discussion on the special uses of colloidal DDT is given.

WARNING SYSTEM

(*Continued from Page 41*)

ice is designed merely to supply a basis for judging whether or not special control measures for late blight will be necessary. If an outbreak such as last year's should threaten, such a a service would be urgently needed. Even if late blight should be unimportant this year, the reporting feature will prevent unnecessary expense and anxiety, and the information gathered by the key men will add to our knowledge of the epidemiology of the disease and establish a background for more efficient forecasting and control in the future. The warning service might thus be interpreted as a form of hazard insurance.

The employment of the Plant Disease Survey organization as a basis for the establishment of a specific plant disease informational service is a logical emphasis of the Survey's functions, new only in the formal concentration of effort to serve a particular restricted purpose. The Plant Disease Survey has from its beginning collected and reported plant disease information with the cooperation of its collaborators and other persons and institutions. Its organization and the relationship of the various cooperators are clearly shown on the accompanying chart, with the warning service superimposed in dotted lines. (See page 41).

INSECT REPORT

(*Continued from Page 52*)

creased rapidly during the latter part of April and early May on peas in parts of New Jersey, Maryland, and Virginia. As of May 10, about 300 acres of peas in the Crystal Springs district of Mississippi were seriously infested and rotenone processors informed local mixers of the urgent

need for rotenone supplies to meet the situation. The pea aphid infestation has been very light thus far in northwestern Tennessee, and has not been as high as during the corresponding period last year in the Blue Mountain district of Washington-Oregon.

The cool wet weather which persisted during the latter half of April and early part of May over the eastern part of the country considerably retarded the development of various fruit pests. Codling moth pupation progressed slowly in the North Atlantic and North Central States area. No emergence of the moths had been reported by May 10 in any areas in the eastern half of the country. Heavy codling moth emergence has occurred, however, in the Yakima Valley of Washington, where weather was favorable for development of the insect. The red-banded leaf roller is abundant in southern Indiana and in the eastern panhandle of West Virginia. Egg masses began to hatch in those areas by April 29 and May 1, respectively, and by May 7 were about 60 percent hatched in southern Indiana. Orchard mites have been reported from many areas. No excessive outbreaks have been mentioned, except in the case of the Pacific mite which occurred in the Yakima Valley, Washington, in greater numbers than ever before recorded. The European red mite was also more abundant than usual there this spring, apparently due to a period of unusually early warm weather which prevented some growers from applying the dormant oil spray. By May 10 practically all adults of the plum curculio had come out of hibernation in the Fort Valley area of Georgia, and this insect was becoming abundant in peach orchards of western Kentucky, southern Illinois, southern New Jersey, and Pennsylvania.★★

2,4-D TREATMENTS

(*Continued from Page 37*)

free of contaminating weed seeds as a result of the use of 2, 4-D. As much as 40% of the grass seed may be lost in the cleaning operations required to remove weed seeds. The principal benefit from the use of 2, 4-D seems to be in removing the weeds in the field prior to harvest so that rigorous cleaning is not necessary. Germination experiments on grass and seed produced on areas treated with 2, 4-D indicate that fall treatment of the seed fields with as much as 1½ to 9 lb. of 2, 4-D per acre has not adversely affected Kentucky bluegrass seed. However, there is the possibility that at some stages of flower development 2, 4-D may have some effect on the development of seed, and further experiments are in progress in which various kinds of grasses are being treated with 2, 4-D at different stages of development to obtain information on this point.

Fertilizer mixtures containing 2, 4-D are extremely toxic to most garden crops, such as beans, tomatoes, squash, cucumbers, spinach, kale and others. The lawn weed control mixture should therefore be conspicuously labeled so that it cannot be mis-

Are You Using

R·T·VANDERBILT·CO·N·Y·S·A·
PYRAX ABB
AMERICAN PRODUCTS

the versatile carrier. Successfully used in

WEED KILLERS
RODENTICIDES
INSECTICIDES
FUNGICIDES
LIVESTOCK DUSTS
HORMONE POWDERS

Literature and samples on request

R. T. VANDERBILT CO., INC.
Specialties Department
230 PARK AVENUE, NEW YORK 17, N. Y.

STERLING
The Standards of Quality
24 KT.

and NICHOLS
TRIANGLE BRAND
COPPER SULPHATE
99% PURE

Also
NICKEL SULPHATE — COPPER OXIDE
SELENIUM — TELLURIUM
Z-C BRAND ZINC SULPHATES

PHELPS DODGE REFINING CORPORATION
Electrolytic Refiners of Copper
40 Wall Street, New York 5, N. Y. · 230 N. Michigan Ave., Chicago 1, Ill.

taken for the regular mixtures used on garden or truck crops. Most home owners may find it advantageous to use on the lawn all of the 2, 4-D mixture on hand so that small quantities that may be left over will not become mixed with the other fertilizers.

Equipment used in grinding, mixing or distributing the 2, 4-D mixtures should be cleaned thoroughly before running through other batches of fertilizer or other materials that may be used on garden or truck crops. Where it is feasible to do so a safe policy would be to use separate equipment for mixing and handling the 2, 4-D mixtures.★★

LABELING PROBLEMS

(*Continued from Page* 31)

Special analyses made by one laboratory indicate that the true active ingredient in the commercial product may amount to only about 18 percent. Biological tests on this active fraction seem to confirm that it is the active ingredient. If this is definitely established to the satisfaction of all concerned, it will mean a revision of the ingredient statement on the labels of products containing hexaethyl tetraphosphate.

New antidotes. Last year the California State Board of Pharmacy revised the official antidotes and set up different requirements for labels from those stated as the official antidotes for the guidance of physicians. Copies of the official antidotes were printed and one copy was sent to each economic poisons registrant. When new labels are printed for poisonous materials, the revised antidote should be used.

Auxiliary plant chemicals. These are described in the California Agricultural Code as: ". . . substances such as hormones, auxins, materials for reducing pre-harvest drop of fruit, materials for promoting rooting of cuttings, bacterial inoculants, and similar products intended to be used for influencing plants."

These materials must be registered before being offered for sale in California, although there is no fee for registration. Many of the hormones and similar materials are handled by economic poisons registrants who may not be familiar with the provisions of the fertilizing materials law. If anyone has auxiliary plant chemicals, it is suggested that he contact his state enforcement office to learn the legal requirements involved.

Proper labeling of an economic poison may be complicated if hormones are included in that group. The hormone is usually not an active ingredient in economic poisons, and needs to be stated separately from the regular economic poison statement of ingredient.

Inclusion of a hormone in a regular tomato insecticide dust has been considered undesirable in the light of present information. To include a hormone may bring injury to the plant, and so far there is no indication of benefit from continued application. Accordingly, economic poisons registration has not been issued for such products.★★

FUNGICIDAL ADHESIVE

(*Continued from Page* 26)

not cause fruits to drop nor does any other component of the mixture when used by itself. A mixture is necessary to cause the reaction. In addition, the fruit-thinning combination has fungicidal value for control of some fruit diseases.

The foregoing data are by no means complete. These data will be augmented by others as the interest in organic polysulfide polymers increases and new uses are investigated. They tend, however, to explain the wide and diversified interest these materials have created among investigators as well as indicate why the latices are considered of merit and worthy of future consideration. ★★

GUEST EDITORIAL

(*Continued from Page* 16)

quired eight or nine sprays of lead arsenate or cryolite.

The most serious limitation to the use of DDT for codling moth control has been the increased difficulty in controlling various species of mites. It is hoped that some material or practice will be found to remedy this situation, but at the present time no satisfactory material or method is known to us. Thus the widespread use of DDT at this time is hazardous since mites can cause losses varying from slight to 100 percent of the crop.

Wooly apple aphis has also been significantly more numerous in DDT sprayed orchards and probably will require special control measures. New pests of little or no economic importance at present, may also result from DDT usage. Washington is extremely fortunate up to the present in its freedom from Apple maggot, Plum curculio, Japanese beetle, leaf roller and other pests of considerable importance in other major apple producing areas of the U. S. It will be interesting to watch developments with a swing to DDT.★★

LISTENING POST

(*Continued from Page* 51)

of a dinitro fungicide has not been applied to reduce the amount of scab over-wintering in the fallen leaves. From Maryland, also, similarly heavy carryover and resultant likelihood of severe scab is reported. Favorable weather conditions for its development will increase the possibility.

Late Blight. In Southern Louisiana, late blight is causing losses of as much as 50 percent or more in potato fields, and is also prevalent on tomatoes. A potato spraying and dusting demonstration showed that the disease could be controlled even when weather conditions were favorable for its development. A case of late blight on tomato seedlings in a New Jersey greenhouse was found to have originated from a few tomato plants brought into the greenhouse last fall from a farm known to have had tomato blight.

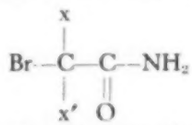
Blue Mold. Tobacco blue mold continues to develop under favorable conditions. The disease has been found in Maryland in addition to the states reported earlier. Scarcity of "Fermate" hampers control.

Downy Mildew. Cucumber downy mildew is reported as having been present for several weeks in some cucumber-growing regions of Florida, causing fairly heavy, although spotty, damage.★★

Industry Patents

The following patents have recently been issued by the U.S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U.S. Patent Office, Washington 25, D.C.

2,419,888. SEED AND PLANT DISINFECTANTS. Patent issued April 29, 1947, to Kenneth G. Nolan and Ingenuin Hechenbleikner, Stamford, Conn., assignors to American Cyanamid Co., New York. A composition for the control of seed and plant diseases comprising a toxic amount of a compound of the formula:



in which X and X′ are chosen from the group consisting of hydrogren, cyanogen, thiocyanogen and halogen, and a solid inert filler.

2,420,271. INSECT REPELLENT COMPOSITION. Patent issued May 6, 1947, to Bernard V. Travis and Howard A. Jones, Orlando, Fla.; dedicated to the free use of the people of the U. S. An insect repellent composition comprising p-iso-propylphenylethyl alcohol incorporated in zinc oxide in such amounts as to form a paste-like composition.

2,420,389. INSECT REPELLENT COMPOSITION. Patent issued May 13, 1947, to Bernard V. Travis, Orlando, Fla., and Howard A. Jones, Washington, D. C.; dedicated to the free use of the people of the U. S. An insect repellent composition comprising a solution of about 36 parts by weight of dimethyl phthalate and about 9 parts by weight of 2-ethyl-1,3-hexanediol incorporated in zinc oxide in such amounts as to form a paste-like composition.

Trade Mark Applications

CHEMI-KILL, in Cooper upper and lower case letters, for insecticides, fungicides, herbicides and insect repellants. Filed Oct. 14, 1945, by Chemi-Troll Products, doing business as Commercial Chemical Co., Gibsonburg, Ohio. Claims use since October, 1945.

CHEVRON . . . in Italic letters, with a wing motif atop the "v" in the word. For parasiticides; namely, insecticides, germicides and fungicides, disinfectants, antiseptics, deodorants and cleaners, for use on animals, poultry, etc. Filed July 16, 1946 by Standard Oil Co. of California. Claims use since May 17, 1946 on mark as described, and since Feb. 26, 1942 on word "Chevron" in connection with insecticides and fungicides.

WB-50, in black letters, for insecticides. Filed June 5, 1946, by Pennsylvania Salt Manufacturing Co., Philadelphia. Claims use since Feb. 21, 1946.

CYLON, in widely-spaced capital letters, for insecticides in liquid, spray and dust form and ant poisons for agricultural, horticultural, or household use. Filed June 7, 1946, by American Cyanamid & Chemical Co., New York. Claims use since June 3, 1946.

NIPHOS, in sans serif capital letters, for chemical products for use in combatting insects and fungi. Filed July 17, 1946, by Monsanto Chemical Co., St. Louis, Mo. Claims use since July 9, 1946.

AERO-PHOS, in Italic letters, for natural Florida Phosphate for fertilizing purposes. Filed May 1, 1946, by American Cyanamid Co., New York. Claims use since April 24, 1946.

GREEN THUMB MARL . . . in stencil-type capital letters, for fertilizer. Filed May 17, 1946, by Maryland Lime & Fertilizer Corp., Hagerstown, Md. Claims use since Mar. 11, 1946.

ORTHO-GUARD, in sans serif capital letters, for parasiticides, namely, insecticides, fungicides, germicides and herbicides. Filed Apr. 16, 1946, by California Spray-Chemical Corp., Richmond, Calif. Claims use since Mar. 22, 1946.

TRICLANE, in shadow-letters, slanting upward, for insecticide. Filed Aug. 2, 1946, by Woolfolk Chemical Works, Ltd., Fort Valley, Ga. Claims use since September, 1945.

STIMGRO, in capital letters, for fertilizers. Filed July 16, 1946, by California Spray-Chemical Corp., Richmond, Calif. Claims use since July 7, 1946.

GOLD-I-CIDE, in hand-drawn capital letters, for germicides and fungicides. Filed Dec. 15, 1945, by Harry L. Goldwag, doing business as Goldicide Laboratories, New York. Claims use since Oct. 23, 1945.

MIST-O-MIZER, in slanting capital letters, for insecticide dispensers of special type, in the nature of non-mechanical pressure type canisters containing insecticides. Filed Feb. 12, 1946, by Regal Chemical Corp., Brooklyn, N. Y. Claims use since Dec. 6, 1945.

FARMCRAFT, in black capital letters, for insecticides. Filed June 17, 1946, by Farmcraft, Inc., Portland, Oregon. Claims use since May 31, 1946.

PERIPHENYL, in Roman capital letters, for liquid and powder insecticides. Filed July 2, 1946, by Western Exterminating Co., Newark, N. J.

TERRA-LITE, in hand-drawn letters for fertilizer preparation used to aerate the soil. Filed May 27, 1946, by Universal Zonolite Insulation Co., Chicago. Claims use since Oct. 19, 1943.

Trade Marks Granted

429,272—INSECTICIDES. Filed October 29, 1945, by C. R. Parsons, doing business as Parsons Chemical Works, Grand Ledge, Mich.

429,309—NAPTHAS FOR USE AS INSECTICIDE BASE OILS AND AS SOLVENTS. Filed Feb. 28, 1946 by Phillips Petroleum Co., Bartlesville, Okla.

429,325 — ACTIVE CHEMICAL INGREDIENT FOR USE IN THE MANUFACTURE OF INSECTICIDES. Filed Apr. 16, 1946, by Hercules Powder Co., Wilmington, Del.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 1st of month.

Plant Pathologist: PH.D. with sound training and field experience in horticulture, vegetale and nursery crops desires position with progressive insecticide and fungicide firm in research or sales development. This, plus experience in handling technical sales correspondence, advertising and publicity means competent service to you and the customer. Address Box 162 care of *Agricultural Chemicals.*

Wanted: Technical specialist for control of insect pest and plant disease problems for permanent connection with large vegetable grower along Eastern Seaboard. Should also be qualified to advise on fertilizer and seed selection. Address Box 163 care of *Agricultural Chemicals,* giving full details as to qualifications, experience, salary desired, etc.

For Sale: Schultz-O'Neil 28" Pulverizer, Howes Auger Filler, 20x48 Rotex Screen, Abbe OS Sifter, Union Special Weighing Machine. All in good condition, offered for sale by original purchaser. Priced right. Principals only. Also several copper kettles, filling machinery, tanks, etc. If interested, write Box 164 care of *Agricultural Chemicals.*

Chemist: Young chemist will undertake investigations of the chemical, drug, and allied literature for manufacturers or others contem plating producing or marketing new products. Full past histories. Rates reasonable. Address Box 165 care of *Agricultural Chemicals.*

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist
(Formerly Director of Science, Government of the Philippine Islands; Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)
ADVISOR ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS
Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.
1118 Emerson Street
Palo Alto, California

INSECTICIDE CONSULTANTS
Trained and experienced in distributors' and manufacturers' problems.
AMHERST CHEMICALS, INC.
Dean Asquith, Entomologist
18 Nutting Ave. Amherst, Mass.

•

Hammer Mill Announced

Buffalo Hammer Mill Corporation, Buffalo, N. Y., announces a new type of double action type of hammer mill, designed to crush whole compressed caked material made in large slabs. The whole cakes are fed into a battery of revolving hammers which break the material into small sections, then in turn pulverize the broken pieces into the desired particle size. Simplicity of design is gained by all-welded, steel plate construction, according to the manufacturers. This also permits flexibility to meet special requirements, the makers say. Photographs and other descriptive material are available from the company offices, 27 Washington St., Buffalo 3.

•

"TIFA" in New Location

Todd Shipyards announces a new address for its Combustion Equipment Division which was recently moved to 81-16 45th Ave., Elmhurst, L. I., New York. The new plant, consisting of a large one-story factory building and a three-story office building adjoining, gives 40 percent more floor space than its former location in Manhattan. The Combustion Equipment Division developed and manufactures the "TIFA," insecticidal fog applicator.

•

A new insecticide, arylalkylthianophosphate, or "3422," is soon to undergo laboratory tests at American Cyanamid Co., New York. No information is yet out regarding its toxicity to certain insects, but should be after some months of testing.

Advertisers' Index

American Cyanamid Co. 12
Andrews, W. R. E. Sales Co. 68
Amherst Chemicals, Inc. 73
Ampion Corp. 68
Associated Chemists, Inc. 64
Atlas Powder Co. ..... April
Attapulgus Clay Co. 13
Baird & McGuire, Inc. 10
Baker, J. T. Chemical Co. ..2nd Cover
Barclay Chemical Co., Inc. ..... May
Besler Corp. ..... May
Brooklyne Chemical Co. ..... April
Calif. Industrial Minerals 44
Chipman Chemical Co. ..... April
Commercial Plastics Co. ..... May
Cox, Dr. Alvin J. 73
De Ong, Dr. E. R. ..... May
Dodge & Olcott, Inc. 46
Dula Co. ..... April
E. I. du Pont de Nemours & Co... 38
Faesy & Besthoff, Inc. 52
Floridin Co. ..... April
Fumeral Co. ..... April
Geigy Co., Inc. 54
Griffin Chemical Co. 68
Greeff, R. W. & Co. ..... May
Hercules Powder Co. ..... April
Hudson, H. D. Mfg. Co. ..... May
Hyman, Julius & Co. 32
Kolker Chemical Works ..... May
Lawrence Aero Mist Sprayer Co... 58
Loomis, W. H. Talc Corp. ..... April
Lowell Mfg. Co. 56
McConnon & Co. 48
McLaughlin Gormley King Co. 62
Merck & Co., Inc. 42
Monsanto Chemical Co. ..... 3 & 11
Montrose Chemical Co. ..... April
Naugatuck Chemical Div. ..... April
Neuberg Co., Inc., Wm. B. ..... May
Niagara Sprayer & Chemical Co.. May
Orbis Products Corp. 6
Penick, S. B. & Co. 34
Pennsylvania Salt Mfg. Co. 4
Phelps-Dodge Corp. 70
Powell, John & Co. ..... 7 & 14
Precision Scientific Co. 62
Prentiss, R. J. & Co.....3rd Cover & 30
Rohm & Haas Co. 36
Scottdel, Inc. 67
Southeastern Clay Co. ..... April
Southwestern Talc Co. ..... May
Sprayer Corp. of America 64
Stauffer Chemical Co. ..... 40 & 49
Taylor Chemical Co. ..... April
Tennessee Corporation ..... May
Thompson-Hayward Corp. ..... April
Tobacco By-Products & Chemical Corp. 50
Todd Shipyards ..... May
Tykor Products, Inc. ..... May
United Clay Mines 60
U. S. Rubber Co. ..... April
Vanderbilt, R. T. & Co. 70
Velsicol Corp. 8
Westvaco Chlorine Products Co. 4th Cover

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

"Sure, yo' can dream, Cuthbert, but remember, yo' competitors ain't asleep!"

It's Waking-Up Time!

COMPETITION is just too keen these days for anyone in the agricultural insecticide, fungicide, weed killer or fertilizer field to sit and dream of the sellers' market just past, or to think seriously of marketing merchandise without going after the business. The best medium we know of to tell prospects about your products, is the business paper covering your industry. And in the field of chemicals for agriculture, the number one choice on your list logically should be

AGRICULTURAL CHEMICALS

254 WEST 31st STREET NEW YORK 1

TALE ENDS

A Michigan pathologist makes a plea for the designation of all the various new chemical compounds used for fungicides and insecticides and other agricultural purposes by some descriptive, easily remembered common name, rather than a "senseless combination of letters or numbers." Initialling alone leads to unnecessary confusion in growers' minds, with sometimes highly unfortunate results, as in one case when 2,4-D was used instead of DDT for the control of codling moth.

•

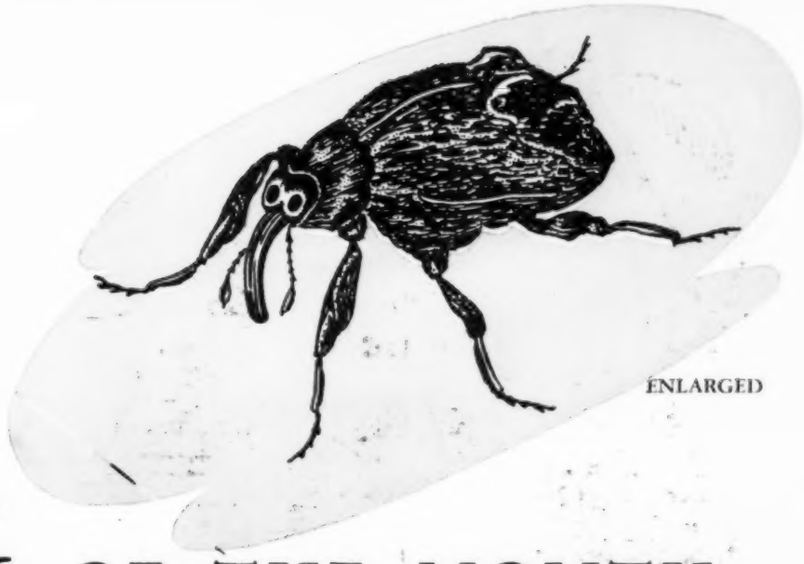
One of the most puzzling mysteries of the year, to U.S.D.A. entomologists and others interested in pest control, is the question of from what part of the world did Long Island's golden nematode come? Farmers in the area where 3,400 acres of potato land are now under strict quarantine, believe that the parasite has arrived within the past six years. U.S.D.A. research has disclosed, however, that as early as 1934, potato vines in the Nassau County area had been stunted by what was later identified as the golden nematode. Its source has been frequently named as Prince Edward Island, from which place the nematode was assumed to have been included in bags of potatoes shipped into the U. S. However, entomologists say that the variety found there is different from the one now infesting Long Island. The U.S.D.A. says that the pest "probably came here from Europe." Beyond that, there is no official statement as yet. The answer will no doubt be forthcoming later, but for the present the major problem is that of controlling the nematodes which are definitely in U. S. soil regardless of their origin.

•

Melvin Goldberg of Geigy Co., Inc., New York, has a new member in his family as of May 21. The baby boy, who weighed in at 8 lbs. 13 oz., was named Alfred . . . initials "A. G." Not a bad start for a youngster almost sure to follow his father in the agricultural insecticide field.

PLUM
CURCULIO

(*conotrachelus nenuphar Herbst*)



ENLARGED

BUG OF THE MONTH

. . . controlled with Benzene Hexachloride

THIS ubiquitous snout beetle attacks plums, pears, peaches, cherries, apricots, prunes, nectarines, quinces, and other cultivated and wild fruits. Although its primary food is stone fruits, it is also extremely fond of the apple, and becomes second to the coddling moth in point of damage.

Injury results in swollen, knotty and early-dropping apples; wormy and rotten cherries; punctured and rotten peaches and plums. The plum curculio is one of the main agencies in spreading brown rot, and its eradication is intimately connected with reduction of brown rot damage.

Orthodox methods of control have not proved successful, perhaps because the eggs are laid and grubs develop in the fleshy part of the fruit, so that the skin protects them until damage is done. With the advent of Benzene Hexachloride, however, effective control of this insect may become a reality.

BHC is one of the most potent insecticides ever tested, yet appears one of the safest. It evaporates slowly, but completely, leaving no residue at harvest time. Acting as a fumigant as well as a stomach and contact poison, it makes possible dusts and sprays which will search out and kill the curculio wherever it may lurk.

Prentox Benzene Hexachloride Concentrate is available now, in quantity, as a dry free-flowing powder or wettable powder. It contains the highest practical percentage of the active gamma isomer. Particle size is carefully adjusted to develop optimum vapor pressure. Place your order now to assure earliest possible shipment.

R. J. PRENTISS & CO., Inc.

110 WILLIAM STREET, NEW YORK 7, N. Y. 9 SO. CLINTON STREET, CHICAGO 6, ILL.

PRENTOX PEST-TESTED CONCENTRATES SOLD TO
INSECTICIDE MANUFACTURERS ONLY

FOR DETAILS ON PRENTOX BHC TURN TO PAGE (30)

Since he fashioned the first wooden plow, man has sought constantly to increase earth's productivity . . . by learning to sow in furrows, by breeding plants . . . and finally by protecting against infestation.

Now MECHANIZED SOIL FUMIGATION WITH HIGHLY-VOLATILE ETHYLENE DIBROMIDE MIXTURES THAT CONTROL ROOT PARASITES

Promise of such great achievement merits the attention of the entire Agricultural Chemicals industry. Important producer of Bromine and Brominated Compounds, Westvaco is prepared to discuss delivery of its effective Ethylene Dibromide mixtures . . . Westvaco SOILFUME 60-40 and Westvaco SOILFUME 80-20 for the elimination of root-knot nematodes and wireworms. Your inquiry for prices and samples will receive prompt attention.

Westvaco CHEMICALS

WESTVACO CHLORINE PRODUCTS CORPORATION

405 LEXINGTON AVENUE • NEW YORK 17, N.Y. • MU 9-4920

CHICAGO, ILL. • DETROIT, MICH. • CLEVELAND, OHIO • CINCINNATI, OHIO

GREENVILLE, S.C. • ST. LOUIS, MO. • LOS ANGELES, CALIF. • NEWARK, CALIF.